SAN FRANCISCO PUBLIC LIBRARY
3 1223 06178 4626

CONNECTION PROJECT

U.S. Department of Transportation
Urban Mass Transportation Administration and
San Francisco Department of City Planning

San Francisco, CA

DRAFT

Environmental Impact Statement

DOCUMENTS DEPT.

OCT 27 1982

SAN FRANCISCO
PUBLIC LIBRARY

October 1982

5/S

San Francisco Public Library

GOVERNMENT INFORMATION CENTER
SAN FRANCISCO PUBLIC LIBRARY

REFERENCE BOOK

Not to be taken from the Library

DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
WASHINGTON, D.C. 20590

DRAFT ENVIRONMENTAL IMPACT STATEMENT

MUNI J LINE CONNECTION PROJECT

SAN FRANCISCO, CALIFORNIA

10/7/82
Date

Charles H. Graves
Director
Office of Planning Assistance

COVER SHEET

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969, and Sections 3(d) and 14 of the Urban Mass Transportation Act of 1964, as amended; and

Pursuant to Sections 21083.7 and 21151 of the California Environmental Quality Act of 1969, as amended, California Public Resources Code Section 21000, et seq.

RESPONSIBLE AGENCIES:

Lead Agencies: Urban Mass Transportation Administration
San Francisco Department of City Planning

Cooperating Agency: San Francisco Municipal Railway

TITLE OF PROPOSED ACTION: Muni J Line Connection Project, San Francisco, California

ABSTRACT: This report documents environmental impacts of three alternative alignments of the J-Church street car line of the San Francisco Municipal Railway System to connect the existing terminus at 30th and Church Street with the storage facility at San Jose and Ocean Avenue. The three build alternatives are the San Jose Alignment, the Monterey Boulevard Alignment and the Mission Street Alignment. A no-build alternative is also considered.

COMMENTS ON DRAFT EIS:

Written Comments on the DEIS should be sent to:

Charles H. Graves, Director
Office of Planning Assistance
Urban Mass Transportation Administration
San Francisco, CA 94102
Washington, DC 20590

For further information, please contact:

Gail Bloom
San Francisco Department of City Planning
450 McAllister Street

(415) 558-5261

A public hearing will be held on December 16, 1982. The time and place of the hearing will be advertised in local newspapers. Comments must be received by December 17, 1982.

3 1223 06178 4626

SUMMARY

A. PURPOSE OF AND NEED FOR PROJECT

The San Francisco Municipal Railway (Muni) has determined that the J Line Connection project is needed for the following reasons:

1. Revenue service would provide a connection linking the Mission District with the southern portion of the City.

2. Additional service would be provided to riders at lower costs to Muni.

3. In the event of a line blockage in the Twin Peaks Tunnel, K, L and M cars would have an alternate route available to and from the Market Street subway via Church Street.

4. Impacts on Ocean Avenue resulting from operation of all J and N, as well as K and L, pull-in and pull-out cars would be reduced. In addition, the 26-line would become a more community-oriented service, reducing noise and adverse impacts of motor coach operation on Chenery Street.

5. Improved service would be provided for Glen Park.

B. PROJECT DESCRIPTION

Muni proposes to connect the present terminal of the J-Church streetcar line at 30th and Church Streets with the Muni Metro Center at Ocean and San Jose Avenues. Three alternative routes are being considered. Each route would be constructed within street rights-of-way. Muni also proposes operationally to interline the J and M lines to form a loop route.

1. San Jose Avenue Alignment Alternative

This alignment would be routed from 30th and Church Streets via 30th Street and San Jose Avenue to Ocean Avenue, and would be 2.3 miles in length. A subalternative considers routing the alignment from 30th Street, along Dolores Street to San Jose Avenue, and would be 2.2 miles in length. Estimated construction costs would be $10.9 million. Net annual operating savings would be $180,000 to $320,000, depending upon the length of headways and whether the J and M lines are combined.

2. Monterey Boulevard Alignment Alternative

This alignment would be routed from 30th and Church Streets via 30th Street, San Jose Avenue, Monterey Boulevard, Gennessee Street, Judson Avenue, Phelan Avenue and Ocean Avenue, and would be 3.3 miles in length. Estimated construction costs would be $17.4 million. Net annual operating costs would be $180,000 to $390,000, depending upon the length of headways and whether the J and M lines are combined.

3. Mission Street Alignment Alternative

This alignment would be routed from 30th and Church Streets via 30th Street, Mission Street and Ocean Avenue, and would be 2.5 miles in length. Estimated construction costs would be $14.3 million. Net annual operating costs would be $270,000 to $560,000, depending upon the length of headways and whether the J and M lines are combined.

4. No-Build Alternative

The No-Build Alternative would maintain the present system of operations (i.e., J line cars would traverse the Twin Peaks Tunnel to be placed in service).

C. IMPACTS

1. Land Use

All alignments under consideration would be located in existing street rights-of-way or in existing medians. There would be no direct impact on existing land uses and zonings.

2. Visual Effects and Urban Design

Because each alternative alignment would encounter a somewhat different cityscape, the visual impact of the permanent physical structures (overhead wires and support standards) and of the LRV traffic itself would result in different impacts for each proposed alignment.

The overall visual impact of LRVs in the proposed Mission Street Alignment would be influenced by the existing trolley bus wires and by the background of visual elements, which would tend to mask the addition of new permanent physical structures. The street is frequently traversed by buses and larger trucks, so the LRVs would not introduce an entirely new dimension of vehicle. The adjoining properties are in general more commercial than along the other alignments; therefore, the general visual impact, and, specifically the impact on the view from the second story of the streetfront structures would be less than for the other two alignments.

The San Jose Avenue and the Monterey Boulevard Alignments both would pass through the Bernal Cut. The San Jose Avenue Alignment would traverse the entire length of Balboa Park, which would affect the view from the houses on the side of the street opposite the park. In the City College loop section of the Monterey Boulevard Alignment, the permanent physical structures (support poles and overhead wires) would have to be above ground; except along Gennessee Street, all other utilities are currently underground in this area.

The potential for noticeable arcing at night or in humid weather would have an impact in the residential neighborhoods along any of the proposed alternatives.

3. Compliance With Existing Plans and Policies

All alignments under consideration conform generally to the policies of the Transportation Element of the Comprehensive Plan and to the Muni 5-year Plan. Any of the proposed routes would marginally help to reduce dependence on the private automobile by providing improved crosstown service to City College, San Francisco State University and Stonestown Shopping Center. The easier accessibility by public transit to Balboa Park in each case would also conform to the policies of the Citywide Recreation and Open Space Plan.

The alignments would conform to policies stated in the Transportation Element and The Environmental Protection Element in that the Muni J line connection would potentially reduce the impact of the private automobile in neighborhoods and would utilize electricity which is relatively quiet, economical and pollution free when compared to diesel buses.

4. Economic and Fiscal Impacts

The San Jose Avenue Alignment would, in revenue service, generate a net savings to the Muni system, while the other two alternatives would result in net costs. The San Jose Avenue Alignment could be expected to show the greatest savings, followed by the Monterey Boulevard and Mission Street Alignments.

If the No-Build Alternative were selected, construction and operational costs would be saved, although the potential for a system-wide net savings would be lost.

5. Public Services and Utilities

All alignments would potentially require the relocation of both overhead and underground utilities along portions of their respective rights-of-way.

During the construction period, possible minor increases in emergency vehicle response times would be similar in all three alternative alignments.

6. Growth Inducement

The service improvement in and to the affected areas would not have an immediate impact on their current compositions, which are single and multifamily residential neighborhoods interspersed with some commercial and institutional usages. It is not anticipated that the introduction of the J Line Connection would induce either commercial or residential growth in these areas. However, some pressure from landowners to rezone for more intensive residential usage might result along any of the proposed alignments due to the improved transit connections to other sections of San Francisco.

7. Displacement and Relocation

None of the alignments would displace or relocate businesses or residential structures.

8. Transportation

Removal of some parking spaces along the San Jose Avenue Alignment would be necessary to facilitate traffic flow. On the other hand, the loss of a traffic lane each direction on San Jose Avenue at Randall Street would increase congestion. At the San Jose Avenue/I-280 undercrossing, introduction of LRVs in the median would slow traffic measurably. For

the rest of San Jose Alignment, the LRVs would present few problems regarding volume of traffic. The introduction of LRV traffic would tend to slow automobile traffic, thus benefiting the pedestrian. Likewise, traffic speed would be reduced where car-stop platforms were to be built. However, where no such islands were to be built, persons boarding or leaving the LRVs at midstreet stops would be exposed to on-coming traffic. The pedestrian access to the LRV station at Glen Park would cross an off-ramp. As part of the proposed project, signs and flashing amber lights would be installed to reduce the potential for hazards to pedestrians.

Bicycle traffic would be affected by the elimination of the existing (but lightly used) bicycle path in the Bernal Cut.

On the Monterey Boulevard Alignment (i.e. Monterey Boulevard, Phelan Avenue and Ocean Avenue), the LRVs would present few problems regarding volume of traffic. On the Monterey Boulevard Alignment, the tracks on Gennessee Avenue would require removal of parking from one side of the street. The introduction of extra LRV movements at the Ocean/Phelan Avenues and Ocean/Geneva Avenues intersections would create backups on Geneva Avenue in the p.m. peak hour. The introduction of LRV traffic would tend to slow automobile traffic, thus benefiting the pedestrian. Likewise, Traffic speed would be reduced where car-stop platforms were to be built. However, where no such islands were to be built, persons boarding or leaving the LRVs at midstreet stops would be exposed to on-coming traffic. At City College, on the Monterey Boulevard Alignment heavy pedestrian traffic would interface with LRV movement. Bicycle traffic would be affected by the elimination of the existing bicycle path in the Bernal Cut.

Mixed LRV/trolley bus traffic and car-stop islands would measurably slow traffic along the Mission Street Alignment. Removal of some parking spaces would be necessary to facilitate traffic flow along certain segments of the Mission Street Alignment. The LRVs would duplicate existing transit facilities. The introduction of LRV traffic would tend to slow automobile traffic, thus benefitting the pedestrian. Likewise, traffic speed would be reduced where car-stop platforms were to be built. However, where no such islands were to be built, persons boarding or leaving the LRVs at midstreet stops would be exposed to on-coming traffic.

9. Air Quality, Noise and Vibration

Impacts on air quality and impacts for noise and vibration would be similar and practically unmeasurable for each proposed alignment.

With regard to noise, LRV traffic would represent an actual decrease in impact levels where such service replaces bus service, an advantage over the No-Build Alternative. However, with regard to vibration, although the effects of an LRV pass-by are so minimal that they are only barely perceptible, the three proposed alignments introduce vibration as a new form of disturbance in the affected residential neighborhoods.

During the approximately three to five weeks that it would take to complete a section of track, maximum noise could be generated during the two to four days of pavement removal and spike driving. In general, other construction noise would not exceed existing truck and bus noise in the area.

10. Vegetation

The San Jose Avenue Outside-Lane Subalternative could affect one or more of the 13 mature Canary Island Date Palms located in the median of the one-block segment of Dolores Street between 30th Street and San Jose Avenue. Also, near San Jose Avenue and Havelock Street, at least one large Monterey cypress may require trimming.

11. Energy

Energy consumption during the construction phase would vary among the alternative alignments from 500 billion BTUs (the equivalent of 90,000 barrels of oil) for the San Jose Avenue Alignment, to 570 billion BTUs (100,000 barrels of oil) for the Mission Street Alignment, to 780 billion BTUs (140,000 barrels of oil) for the Monterey Boulevard Alignment. Once in operation, the San Jose Avenue Alignment would result in a savings of 2.9 billion BTUs (500 barrels of oil), the Mission Street Alignment would result in the consumption of an additional 15.5 billion BTUs (2,500 barrels of oil), and for the Monterey Boulevard Alignment an additional 20 billion BTUs (3,600 barrels of oil).

In terms of percentage of the energy consumption for the San Jose Avenue Alignment, the least energy-consumptive alignment, the Monterey Boulevard Alignment, would consume

156% more energy during the construction phase and 360% more per year of operation. The Mission Street Alignment would consume 114% more energy in construction and 280% more per year in operation than would the San Jose Avenue Alignment.

The No-Build Alternative would result in eliminating energy consumption and operation incurred by any of the three alignments.

12. Soils and Geology, Seismicity and Hydrology

Although there are differences in the relative geological, seismological and hydrological impacts of the three alignments, these differences would not translate into noticeably different physical effects. Especially with regard to the impacts of geological differences (mainly landsliding) and of hydrological differences (mainly erosion during construction and silting of the drainage system), mitigation measures could make the net impacts practically the same.

13. Historical and Archaeological Sites

None of the alignments would affect any designated landmark or known archaeological sight.

14. Park and Recreation Lands

All three alignment potentially increase access to Balboa Park and neighborhood mini-parks and playgrounds near each respective alignment. The San Jose Alignment would offer access along the entire eastern boundary of Balboa Park and especially to the public swimming pool.

D. MITIGATION MEASURES

If the project is constructed and becomes operational the following mitigation measures will be done.

1. Land Use and Urban Design

Scheduling and methods of construction will be designed to minimize interference with access to properties adjoining the chosen alignment and to reduce effects of construction dirt and noise.

To mitigate visual impacts of the completed alignment, the overhead wires will be hung wherever possible from existing overhead utility and street lamp standards.

2. Public Services and Utilities

The police and fire departments and emergency ambulance services will be made aware of any temporary traffic detours established during construction.

Trenching near water mains will be hand dug to maintain cover required by the Water Department.

3. Transportation

For the San Jose Avenue Alignment, signalization will be revised at the San Jose Avenue-Randall Street intersection to minimize congestion.

4. Air Quality

Dust pollution during construction will be controlled by watering exposed surfaces, restricting traffic on unpaved surfaces, covering trucks loaded with dirt and minimizing the period during which soils are exposed.

Scheduling construction to minimize interference with traffic flow will be done to minimize local pollution during construction.

5. Noise and Vibration

Nonrigid track construction methods could be used to reduce vibration along the alignment. If engineering design analysis shows this to be a serious problem, the project will be designed to reduce the vibration levels below background levels.

6. Energy

Reducing the energy costs of operation could be accomplished by increasing headways, omitting the loop at the Metro center terminus from the transit routes and/or stopping the J-Line at 30th Street and turning every other car back towards downtown. These operational mitigation measures will be considered by Muni to achieve an acceptable balance between transit service goals and energy conservation.

7. Geology and Seismicity

A geotechnical study of the selected alignment will be necessary to identify any localized geologic hazards which might affect the rail bed. Foundation studies will be carried out and their recommendations followed where grade modifications are proposed, particularly in filled areas. Construction will be performed to meet all appropriate engineering design requirements, thus reducing the potential for slumping or settlement.

Backfill will be compacted to reduce the potential for future settlement.

Revegetation of slopes disturbed during grading will be done to retard soil loss and impart limited stability for earthquake-induced landsliding. An inspection by a geotechnical engineer of existing landslide areas will be made to assess the need for restablizing any recent landslides along the selected alignment, particularly in the designated landslide hazard zone north of Balboa Park.

Should signs of structural weakness in the Stanford Heights Reservoir appear, Muni officials will be alerted through the Emergency Plan for the City so that precautions can be taken.

8. Hydrology

Siltation of the City storm drain system will be minimized by screening drain inlets. Any surfaces exposed during the rainy season will be covered to minimize erosion and siltation of storm drains.

E. AREAS OF CONTROVERSY

Community concern has been centered around the issues of noise and vibration, disruption of neighborhoods by LRV service, potential impacts to the palm trees on Dolores Street, and traffic safety through the I-280 underpass.

F. ISSUES TO BE RESOLVED

The principal issues to be resolved are whether to build the J-Line Connection, the alignment to use for the J Line Connection, and what will be the source of financing and the level of Federal funding.

TABLE OF CONTENTS

		Page
	SUMMARY	i
I.	PURPOSE OF AND NEED FOR ACTION	1
II.	ALTERNATIVES INCLUDING THE PROPOSED ACTION	5
	A. Development of Alternatives	5
	B. Description of Alternatives	6
	C. Evaluation of Alternatives	8
	1. Impacts Common to the Three Proposed Build Alternatives	8
	2. Dissimilar Impacts	16
	3. The No-Build Alternative	18
III.	AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING	20
	A. Land Use and Urban Design	20
	1. Land Use and Zoning	20
	2. Urban Design and Visual Quality	26
	B. Socioeconomic Characteristics	28
	1. Population	28
	2. Public Services and Utilities	29
	C. Transportation	31
	1. Traffic Conditions	31
	2. Transit Conditions	40
	D. Natural Environment	46
	1. Climate and Air Quality	46
	2. Noise and Vibration	48
	3. Vegetation	52
	4. Energy	53
	5. Geology and Seismicity	53
	6. Hydrology	59
IV.	ENVIRONMENTAL CONSEQUENCES/IMPACTS AND MITIGATION MEASURES	62
	A. Land Use and Urban Design	62
	1. Conformance with Existing Land Use	62
	2. Displacement and Relocation	63
	3. Visual Effects and Conformance with Urban Design Principles	63
	4. Compliance with Existing Plans and Policies	65

TABLE OF CONTENTS
(Continued)

		Page
B.	Socio-Economic Impacts	66
	1. Economic and Social Impacts	66
	2. Public Services and Utilities	75
C.	Transportation	82
	1. Impacts on Traffic	82
	2. Transit	94
	3. Pedestrian Impacts	107
D.	Natural Impacts	109
	1. Air Quality Impacts	109
	2. Noise and Vibration	115
	3. Vegetation	120
	4. Energy	121
	5. Geology and Seismicity	124
	6. Hydrology	126
E.	Construction Impacts	127
	1. Land Use and Urban Design	127
	2. Economic and Fiscal	127
	3. Public Services and Utilities	128
	4. Air Quality	129
	5. Noise	130
	6. Energy	132
	7. Geology	132
	8. Hydrology	135
F.	Mitigation Measures That are Included in the Project if Built	135
G.	Unavoidable Adverse Impacts	139
H.	Short-Term Uses of the Environment Versus Long-Term Productivity	141
I.	Irreversible and Irretrievable Commitment of Resources	141
V.	HISTORIC PROPERTIES AND PARKLAND	146
A.	Applicable Laws	146
B.	Section 106 Determination	146
C.	Section 4(F) Evaluation	148
VI.	LIST OF RECIPIENTS OF EIS/EIR	150
VII.	LIST OF PREPARERS	161
VIII.	ORGANIZATIONS AND PERSONS CONSULTED	163
	INDEX	164
	APPENDICES	A-1
	Appendix A: Fundamental Concepts of Environmental Noise	A-1
	Appendix B: Transportation	A-7
	Appendix C: Air Quality	A-9

LIST OF FIGURES

		Page
1.	Regional Location Map	2
2.	Site Location Map Showing Alternative Alignments	7
3.	Zoning Map	21
4.	Neighborhoods, Parkland and Recreational Areas in Project Vicinity	22
5.	Average Daily Traffic Volumes (1974-1976)	33
6.	P.M. Peak Traffic Volumes (1974-1976)	34
7.	Existing Muni Routes	41
8.	Noise Measurement Locations	49
9a.	Geologic Impacts	55
9b.	Legend: Estimated Intensity of Future Ground Shaking	56
10.	Active Fault Zones in the San Francisco Bay Area	57

LIST OF TABLES

		Page
1.	Comparison of Alternatives	9
2.	Existing Transit Route Headways-J Line Extension Corridor	44
3.	Number of Days Selected Pollutants Exceeded State or Federal Standards	47
4.	Noise Measurement Data	50
5.	Day/Night Noise Levels	52
6.	Estimated Incremental Operating Costs and Revenues-San Jose Avenue Alternative	68
7.	Estimated Incremental Operating Costs and Revenues-Monterey Boulevard Alternative	70
8.	Estimated Incremental Operating Costs and Revenues-Mission Boulevard Alternative	72
9.	Estimated Construction Costs	73
10.	Fiscal Impacts of J Line Connection on San Francisco Municipal Railroad	76
11.	Representative A.M. Peak Travel Times	100
12.	Predicted Worst Case CO Concentrations in 1985	111
13.	Predicted Change in Regional Vehicle Miles Traveled in 1985	113
14.	Sensitive Air Quality Receptors	114
15.	Maximum Noise Levels of Light Rail Vehicles at a Distance 33 Feet from the Track Outdoors	116
16.	Estimated Energy Consumption Under Three Alternative J Line Routes	122
17.	Construction Equipment Noise Levels	131
18.	Construction Energy Costs of J Line Build Alternatives	133
19.	Architecturally Significant Buildings	147

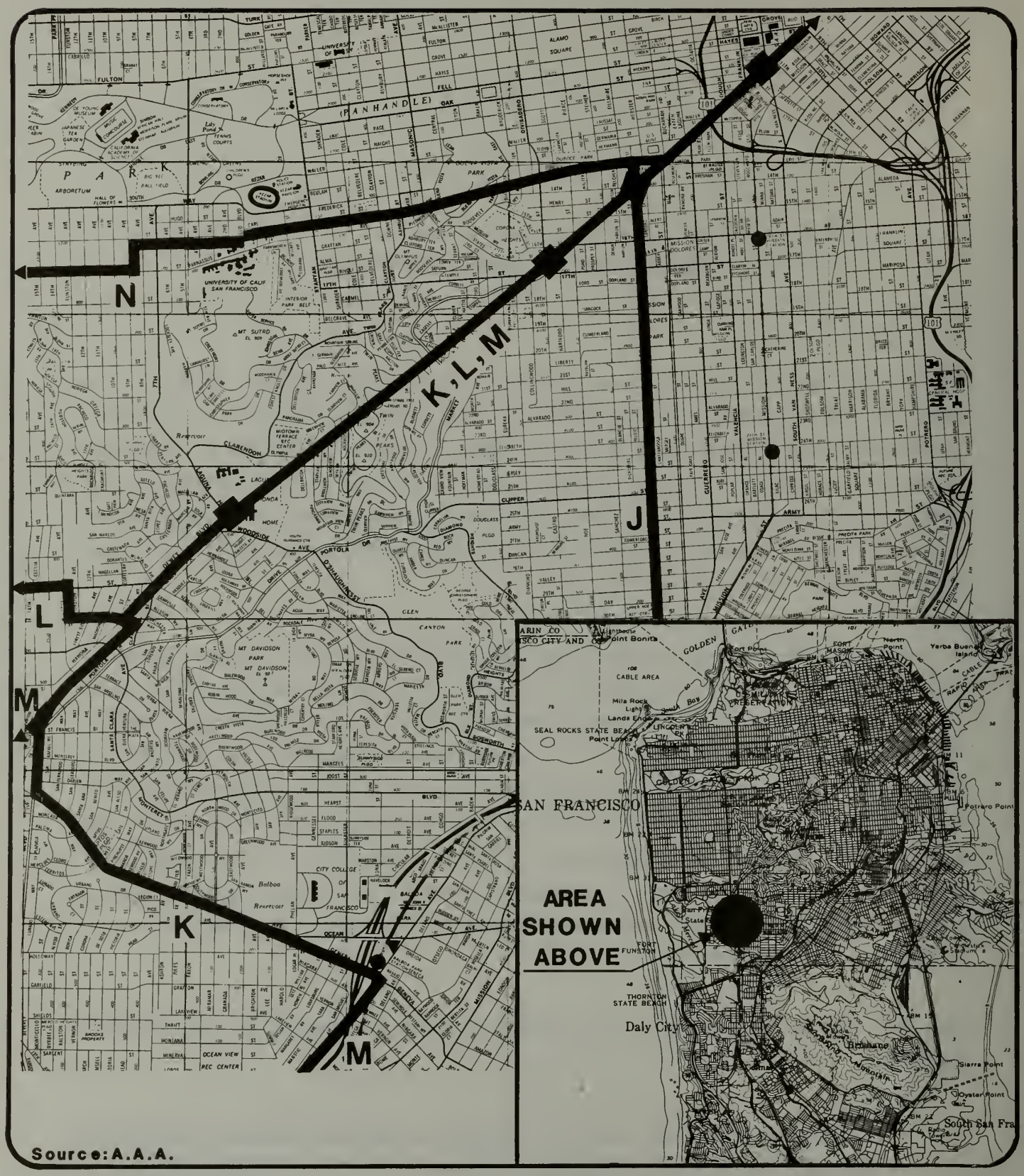
I. PURPOSE OF AND NEED FOR ACTION

The San Francisco Municipal Railway (Muni) operates five high capacity streetcar lines which are being modernized and upgraded. The J-Church, K-Ingleside, L-Taraval, M-Oceanview and N-Judah lines, shown in Figure 1, page 2, constitute an important element of the downtown-oriented radial service to and from the Twin Peaks and Sunset areas of the City. It is typical of radial routes that there is a heavy directional demand on these lines for inbound service during the morning commute hours and for outbound service during the evening commute hours.

To meet these demands efficiently extra vehicles are added to serve critical commuter passenger volumes. Service originating at the outer line terminals is supplemented during the morning commute, as is afternoon service originating at The Embarcadero Station. Placing these extra cars into service and removing them from service after the commute hours produces additional operational costs in the form of vehicle usage and employee time. On the N and J lines, the Metro LRVs (light rail vehicles) are stored in the car barn located at San Jose and Ocean Avenues (see Figure 1, page 2); from there, they must travel the K-line route through the Twin Peaks Tunnel to The Embarcadero Station and then to Judah Street or to 30th and Church Streets. This movement of the vehicles known as "pulling out" and "pulling in."

Muni has determined that the J Line Connection project is needed for the following reasons:

1. Revenue service would provide a connection linking the Mission District with the southern portion of the City. If J line service were extended past Balboa Park over the M line as proposed, J line riders could continue not only to Glen Park and Balboa Park, but also to San Francisco State University and the Stonestown Shopping Center.



Regional Location

EXISTING STREETCAR ROUTES

K

BART STATION

MUNI METRO CAR BARN

MUNI METRO STATIONS

North

0 500 1000 2000

Scale Feet

Figure No. 1

2. Additional service to riders at lower costs to Muni. Allowing J and N cars to be placed into and taken out of service via the J line Connection would provide the convenience of additional peak-period service to J line riders while reducing Muni's operating costs. In addition, by providing service on the J line to a larger area of the City, Muni may be able to justify increased service levels, resulting in shorter waiting times, particularly in off-peak hours.

3. Provision of a K, L and M detour route. In the event of a line blockage in the Twin Peaks Tunnel, K, L and M cars would have an alternate route available to and from the Market Street subway via Church Street.

4. Reduction of impacts on Chenery Street and Ocean Avenue. Impacts on Ocean Avenue resulting from operation of all J and N, as well as K and L, pull-in and pull-out cars would be reduced. In addition, the 26 diesel coach line would become a more community-oriented service, reducing noise and other impacts of motor coach operation on Chenery Street.

5. Improved service for Glen Park. At Glen Park the line as proposed would connect with four other Muni lines and BART. Glen Park residents would have direct Muni Metro service both to downtown and to San Francisco State and Stonestown.

The J Line Connection has been considered, planned and debated for over nine years. The first public meeting with neighborhood groups was arranged by the Muni Transit Improvement Program staff on November 1, 1972, and since then numerous community meetings have been held to discuss the Connection and possible alternatives. In 1975, the Muni Transportation and Coordinating Committee awarded Wilbur Smith and Associates a contract to conduct the Planning, Operations, Marketing (POM) study,[1] which defined the proposed J Line Connection and selected it from among six alternative linkages then under consideration. The report was released in 1977.

Community meetings and meetings with other agencies generated the two alternative alignments that are now being considered along with the POM study's recommended San Jose Avenue Alignment and the No-Build Alternative.

An Initial Study[2] was undertaken of the proposed alignments and the results were published in March, 1981. The study was circulated for comment among agencies and interested individuals and groups, and on May 27, 1981, the results were presented and discussed at two Environmental Scoping Meetings. Comments from interested parties were heard or submitted in writing and evaluated; significant and insignificant environmental issues were identified. On the basis of the Initial Study, the Scoping Meetings, and the comments, work proceeded on a Draft EIS/EIR.

The Urban Mass Transportation Administration (UMTA) and the San Franciso Department of City Planning have published the combined Draft EIS/EIR. This document will receive a minimum 45-day review and comment period. A public hearing on the Draft EIS/EIR will be held before the City Planning Commission (CPC) and UMTA. Responses will be prepared to written comments received by DCP and UMTA and to oral comments made at the public hearing. A Certification Hearing will be held by the CPC to determine the adequacy of the EIR. When the document is approved by UMTA, a Final EIS will be published and copies circulated to federal agencies, and the public.

In the event that the project moves forward to the design and construction stages, a period of about six months would be expected to be required for the preparation and review of plans and specifications for bidding. About three months would be needed for preparation, review and approval of bids. Construction would take about two years. Some utility relocation could be completed prior to construction of the tracks.

---

[1]San Francisco Municipal Railway, Transportation Project: Planning, Operation, Marketing New Track Linkage N-J Lines, October 1977. A copy of this report is available at the Department of City Planning, 450 McAllister Street, and at Muni Planning Library, 949 Presidio Avenue, San Francisco, California.

[2]A copy of the Initial Study is available at the Department of City Planning, 450 McAllister Street, San Francisco, California.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. DEVELOPMENT OF ALTERNATIVES

A study of alternative plans that would reduce the unproductive movement of Muni vehicles was prepared in the 1977 POM Study.[1] That study noted particularly high operational costs associated with pulling out and pulling in on the J-Church and N-Judah lines. The inauguration of LRV traffic in the Market Street Tunnel eliminated use of the 11th Street "Y" turnaround, thus increasing the unproductive distance to be traveled on the J line from 8.8 miles to 11.9 miles, and on the N line from about 10.8 miles to 14.6 miles.

To reduce these costs, six alternative plans to modify Muni trackage or operations were analyzed. Alternative 1, the Van Ness Crossover, involved operational changes only. Alternatives 2 to 6 involved new track linkages. Alternative 3, the San Jose Avenue Alignment, is examined in this EIS/EIR, as well as the Mission Street and Monterey Boulevard Alignments, and the No-Build Alternative. A complete examination of Muni's pulling-in and pulling-out operations and a preliminary investigation of the six proposed alternatives can be found in the 1977 POM study.

Alternative 1 of the POM study entailed using the crossover facility west of the Van Ness Station in the Market Street Tunnel. This proposal was rejected for several reasons: the reversing procedure could have potentially disrupted regular service; the plan would not relieve traffic in the Twin Peaks Tunnel nor offer alternative routing flexibility should the tunnel be blocked; safety and personnel factors weighed against this alternative; finally, it would add no new revenue service to the system.

Alternative 2 proposed using the existing 17th Street surface tracks to reduce the distances currently involved in pulling in and pulling out and to eliminate congestion and potential passenger-service disruption in the Market Street Tunnel. This plan was also

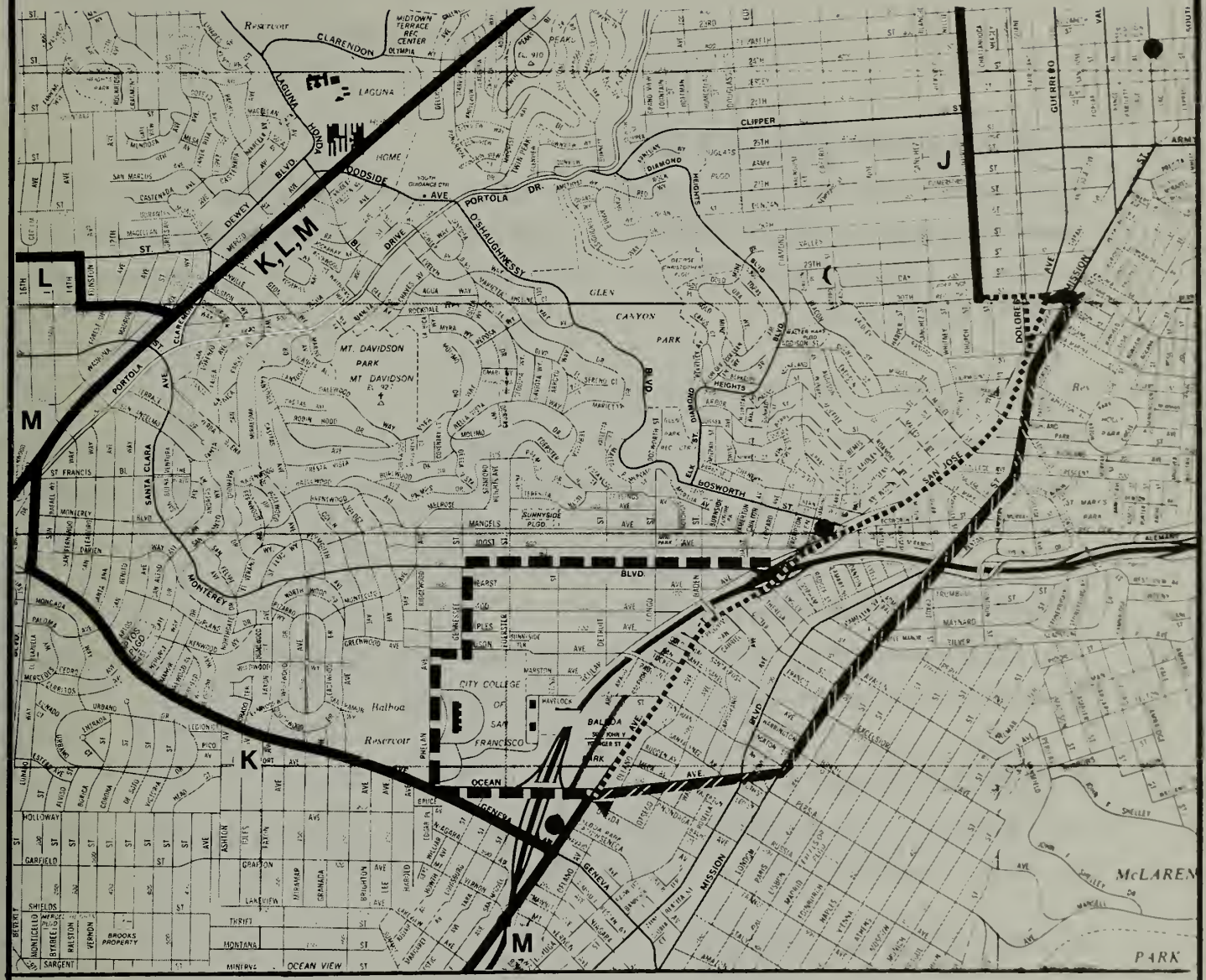
rejected for a number of reasons: it would fail to relieve traffic in the Twin Peaks Tunnel; it would necessitate a complex interface with the Market Street Tunnel signal system; it would reintroduce rail vehicles to street traffic at the Market Street intersections of Church and Castro Streets; and it would fail to generate revenues.

Alternative 3 proposed new track and overhead wires along San Jose Avenue from the existing J-line terminal at 30th Street to the Muni car barn at Ocean Avenue. This alternative was selected by the POM study consultants because it provided a shorter pull-out/pull-in time and distance for the J and N lines and reduced traffic and potential delay in the Twin Peaks and Market Street Tunnels by rerouting such operations outside of the tunnels. This alternative also offered an emergency rerouting possibility for traffic on the K, L, and M lines if the Twin Peaks Tunnel were blocked or otherwise out of service. The consultants recognized in this alternative the potential for revenue service along the J Line Connection, as well as elimination of duplicated service on parts of the 26 coach line. The possibility of a J-M double through-loop was also evaluated. This type of connection would allow J line cars to continue onto the M line (and vice versa) without having to turn around at the car barn.

Alternatives 4, 5 and 6 dealt with possible track linkages between the L line and the N line at Sunset Boulevard, at 46th Avenue and at the Lower Great Highway, respectively. While the specific reasons for rejecting each alternative varied somewhat, the considerations involved: significant reduction of traffic flow; elimination of parking spaces; possible safety problems associated with driveways and LRV traffic; failure to eliminate track conflicts at the West Portal Tunnel entrance; incomplete reduction of out-of-service traffic in the Twin Peaks Tunnel; and failure to generate revenues. In the case of Alternative 6, there were noticeable visual and other impacts on the Lower Great Highway and the lineal park, as well as safety problems associated with interfacing a single-track line segment with double-track lines.

B. DESCRIPTION OF ALTERNATIVES

Muni proposes to connect the present terminal of the J-Church streetcar line at 30th and Church Streets with the Muni Rail Center at Ocean and San Jose Avenues. Muni also proposes operationally to interline the J and M lines to form a loop route. Three alternative routes (Figure 2, page 7) are being considered. Each route would be constructed within street rights-of-way.



..... SAN JOSE AVENUE ALIGNMENT

MISSION ALIGNMENT

MONTEREY BOULEVARD ALIGNMENT

EXISTING STREETCAR ROUTES

K

● BART STATION

▲ MUNI METRO CAR BARN

Site Location Map showing Alternative Alignments

North

0 500 1000 2000

Scale Feet

Figure No. 2

1. San Jose Avenue Alignment Alternative[2]

This alignment would be routed from 30th and Church Streets via 30th Street and San Jose Avenue to Ocean Avenue, and would be 2.3 miles in length. A subalternative considers routing the alignment from 30th Street, along Dolores Street to San Jose Avenue, and would 2.2 miles in length.

2. Monterey Boulevard Alignment Alternative

This alignment would be routed from 30th and Church Streets via 30th Street, San Jose Avenue, Monterey Boulevard, Gennessee Street, Judson Avenue, Phelan Avenue and Ocean Avenue, and would be 3.3 miles in length.

3. Mission Street Alignment Alternative

This alignment would be routed from 30th and Church Streets via 30th Street, Mission Street and Ocean Avenue, and would be 2.5 miles in length.

4. No-Build Alternative

The No-Build Alternative would maintain the present system of operations (i.e., J line cars would traverse the Twin Peaks Tunnel to be placed in service).

C. EVALUATION OF ALTERNATIVES

This section evaluates the three proposed alternative alignments and the No-Build situation. Since all three alignments share a number of similar or equivalent impacts, initial discussion of these similar impacts will aid in the subsequent discussion of the different impacts presented by each proposed alignment. Table 1, page 9, presents a comparison of the alternatives.

1. Impacts Common to the Three Proposed Build Alternatives

All proposed alignments would be located in existing street rights-of-way or in existing medians. There would be no direct impact on existing land uses and zonings. There would be potential for indirect impacts on land use. The service improvement in and to the affected areas would not have an immediate impact on their current compositions, which are single and multi-family residential neighborhoods interspersed with some commercial

TABLE 1. COMPARISON OF ALTERNATIVES

	SAN JOSE AVE. ALIGNMENT	MONTEREY BLVD. ALIGNMENT	MISSION ST. ALIGNMENT	NO BUILD
Land Uses	All alternative alignments occur within existing street rights-of-way and therefore have no direct land use impact.			No change with regard to existing land use.
Visual Effects and Conformance with Urban Design Principal	Overhead wires and support poles coincide with views from second-story living spaces; LRV lighting (interior and headlights) adds to background lighting; arcing effect noticeable against background lighting; addition of LRV traffic introduces new type of large vehicle in local cityscape.			No change from existing conditions.
	Greatest change in visual quality occurs along Balboa Park segment.	Except for Gennessee St., which has heavy above-ground utility lines, the streets have underground utilities. The heaviest concentration of residences occur here; visual impact of overhead wires will occur.	Wires create least visual impact due to existing trolley bus power wires; also, relatively few residences.	
Consistency with Existing Plans and Policies	All plans conform to policies of and meet objectives of the Transportation Element and Environmental Protection Element of the Comprehensive Plan, the Citywide Recreation and Open Space Plan, and the Muni 5-Year Plan, except as noted below:			Would not further objectives and policies of Transportation Element. There would be no crosstown streetcar service to major activity centers from eastern part of City.
	Care must be taken to avoid conflicts between bicycle and LRV traffic on Bernal Cut section of San Jose Ave. per Objective 4 of the Thoroughfares Plan and the Bicycle Plan of the Transportation Element.			

TABLE 1. COMPARISON OF ALTERNATIVES (Continued)

	SAN JOSE AVE. ALIGNMENT	MONTEREY BLVD. ALIGNMENT	MISSION ST. ALIGNMENT	NO BUILD
Economic and Fiscal Impacts (current dollars)	Revenue service on this proposed alignment is expected to result in an estimated net savings over 30 years of $2.2-3.1 million. These net savings include construction capital costs of $10.9 million.	Revenue service on this proposed alignment is expected to result in estimated costs over 30 years of $7.4-8.5 million. These net costs include construction capital costs of $17.4 million.	Revenue service on this proposed alignment is expected to result in estimated costs over 30 years of $8.4-10.4 million. These net costs include construction capital costs of $14.3 million.	No change in existing costs.
Public Services and Utilities	Relocation of both overhead and underground utilities potentially required for portions of each proposed alignment when in direct conflict with construction and operaton of Muni tracks and power utilities. On all proposed alignments, equivalent improvement of access to schools and other public service facilities in affected neighborhoods. During construction, emergency response time could be negatively affected by construction activity.			Public services and utilities adequate as currently provided.
Growth Inducement	Due to the limited vacant space for new residential and commercial development along the vicinity of proposed alternative alignments, the potential for growth inducement appears low. All proposed alternatives would improve service to affected neighborhoods, but it is not anticipated that this would induce growth. It is possible that improved access could induce pressure to change zoning for increased density.			N/A
Displacement and Relocation	None of the proposed alignments would require displacement or relocation within the affected neighborhoods.			N/A

TABLE 1. COMPARISON OF ALTERNATIVES (Continued)

<table>
<tr><th></th><th>SAN JOSE AVE. ALIGNMENT</th><th>MONTEREY BLVD. ALIGNMENT</th><th>MISSION ST. ALIGNMENT</th><th>NO BUILD</th></tr>
<tr><td>Traffic Circulation</td><td colspan="3">The principal impacts would occur at car stops and points at which special traffic signals would be required for LRV turning movements. Tracks in pavement could create hazardous conditions for bicycles, mopeds, etc., and for all vehicles in wet weather.

The presence of boarding islands on high-volume streets with 4 or more traffic lanes would slow moving vehicles.

To facilitate traffic flow, parking spaces adjacent to car stops and at other critical locations would be restricted or eliminated. Overall circulation would improve.</td><td rowspan="3">No effect on existing traffic circulation.</td></tr>
<tr><td></td><td>Through the I-280 undercrossing, tracks in median would require reduced speed limit.</td><td>Remove parking on one side of Gennessee Street.

Derailed LRV at I-280 off-ramp could create bakcup onto freeway, with potential for highspeed accident.

Reduced traffic level of service at Phelan, Ocean, and Geneva intersection.</td><td>Introduction of mixed LRV/bus traffic increases the possibility that each vehicle type would interfere with the other's operation.

LRVs in center lane would create sight barrier for drivers following, thereby increasing potential for delay and disruption with regard to left turns.</td></tr>
<tr><td></td><td colspan="2">Reduced traffic level of service at Randall/San Jose intersections.</td></tr>
<tr><td>Transit Impacts</td><td colspan="3">J-M Loop line, in conjunction with the 54-Felton, would replace the current operation of the outer part of the 26-Valencia route. The 26-Valencia would be rerouted south of the Glen Park BART station.

The J-M Loop line would provide access from the Mission and Ingleside Districts to Stonestown Shopping Center and to San Francisco State University.</td><td rowspan="3">No impact on existing transit.</td></tr>
<tr><td></td><td>Transfer to Glen Park BART station would require walking 200 feet and climbing a 20-foot stairway.</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="3">Duplicating existing service routes along certain segments would increase transit vehicle frequencies and transit capacity along the corridor, but due to limited overall (Citywide) capacity, could result in reduced vehicle frequency on other segments and generally less expansion of other route possibilities. Crosstown transit would improve.</td></tr>
<tr><td></td><td>Additional patronage: 2,500-3,000 daily.

Operating time savings: 2,166 hours/year.</td><td>Additional patronage: 2,000-2,500 daily.

Operating time savings: 2,166 hours/year

Only alignment with direct access with City College.</td><td>Additional patronage: 2,000-3,000 daily.

Operating time savings: 2,166 hours/year.</td><td></td></tr>
</table>

TABLE 1. COMPARISON OF ALTERNATIVES (Continued)

	SAN JOSE AVE. ALIGNMENT	MONTEREY BLVD. ALIGNMENT	MISSION ST. ALIGNMENT	NO BUILD
Pedestrian Impacts	Mid-street car stops would expose boarding and exiting passengers to traffic where no low-level platforms were provided; where provided, such platforms would tend to reduce traffic speed generally, thus improving pedestrian conditions.			No impact on existing conditions.
	Due to LRV turn geometry, south crosswalk across San Jose Ave. at 30th St. would be eliminated.	During school year, potential conflict with pedestrian traffic near City College.	Heavy pedestrian traffic at transfer point at 30th and Mission Streets would be increased; possible conflict between slow-turning LRVs with pedestrian traffic at intersection.	
Air Quality	No measurable air quality impacts are expected to occur at local or regional scale. Effects on sensitive receptors would not be measurable.			
Noise and Vibration	Anticipated levels of vibration would range from imperceptible to barely perceptible. Maximum noise levels anticipated would not exceed typical maximum levels presently existing in the area. Elimination from Ocean Avenue of J- and N-line pull-out and pull-in operations and substitution of quieter LRV for motor coaches south of Diamond and Bosworth would reduce noise in affected areas.			No change with respect to existing conditions.

TABLE 1. COMPARISON OF ALTERNATIVES (Continued)

	SAN JOSE AVE. ALIGNMENT	MONTEREY BLVD. ALIGNMENT	MISSION ST. ALIGNMENT	NO BUILD
Vegetation	If alignment traverses one block of Dolores, one or more of the 13 mature Canary Island Date Palms located in median strip could be affected.	No change with respect to existing conditions.		
Energy	In relation to total construction expenditures, energy costs for this proposed alternative estimated to be 570 billion BTUs (103,000 barrels of oil). Decrease in energy consumption to operate this proposed alternative estimated to be 2.9 billion BTUs (500 barrels of oil) per year.	In relation to total construction expenditures, energy costs for this proposed alternative estimated to be 900 billion BTUs (162,000 barrels of oil). Increase in energy consumption to operate this proposed alternative estimated to be 11 billion BTUs (2,000 barrels of oil) per year.	In relation to total construction expenditures, energy costs for this proposed alternative estimated to be 740 billion BTUs (133,000 barrels of oil). Increase in energy consumption to operate this proposed alternative estimated to be 6.5 BTUs (1,200 barrels of oil) per year.	N/A No change from existing energy consumption.
	Increased transit use could decrease automobile use, with a positive impact on overall energy consumption associated with travel.			

TABLE 1. COMPARISON OF ALTERNATIVES (Continued)

	SAN JOSE AVE. ALIGNMENT	MONTEREY BLVD. ALIGNMENT	MISSION ST. ALIGNMENT	NO BUILD
Soils and Geology	Rock and soil formations along proposed alternative alignments similar except as noted below:			Existing conditions unaffected by any proposed alternative.
	Extensive Colma Formation artificial fill under I-280 segment.	Colma Formation plus exposed Franciscan bedrock.	Extensive thick Colma Formation artificial fill under I-280 segment.	
	Least susceptible to landsliding.	Most susceptible to landsliding.	Susceptible to landsliding.	
	Least susceptible to groundshaking.	Susceptible to groundshaking.	Most susceptible to groundshaking.	
	Susceptible to inundation from Stanford Heights Reservoir in event of "strong" ground motion during a great earthquake.			
		Steepest grades occur along this proposed alignment.		
Historic and Archaeological Sites	None of the proposed alternatives affect designated landmarks or known archeological sites.			Current public transit routes and traffic do not affect designated landmarks or known archeological sites.
		Passes by a city landmark at 236 Monterey Blvd. (Sunnyside Conservatory).		
Park and Recreation Lands	All alternatives potentially increase access to Balboa Park and mini-parks and playgrounds near each respective alignment.			Current public transit service provides adequate access to parks.
	Offers improved transit access along entire eastern eastern boundary of Balboa Park and especially to the public swimming pool.			

and institutional usages. It is not anticipated that the introduction of the J line Connection would create either commercial or residential growth in these areas. However, some pressure from landowners to rezone for more intensive residential usage might result along any of the proposed alignments because of the improved transit connections to other sections of San Francisco.

For all residential neighborhods, the LRV lighting (interior and headlights) would add to background lighting. The potential for noticeable arcing at night or in humid weather would have an impact in the residential neighborhoods along any of the proposed alternatives.

All alignments under consideration conform generally to the policies of the Transportation Element of the San Francisco Comprehensive Plan and to the Muni 5-year (1980-1985) Plan. Any of the proposed routes would marginally help to reduce dependence on the private automobile by providing improved crosstown service to City College, San Francisco State University and Stonestown Shopping Center. The easier accessibility by public transit to Balboa Park in each case would also conform to the policies of the Citywide Recreation and Open Space Plan, although the proposed San Jose Avenue Alignment would serve the entire eastern boundary of the Park.

None of the proposals would displace or relocate businesses or residential structures. All routes could require the routine relocation of both overhead and underground utilities along portions of their respective rights-of-way.

During the construction period, possible increases in emergency vehicle response times would be similar in all three proposed alternatives. Impacts on air quality and vegetation and impacts from noise and vibration would be similar and practically unmeasurable for each proposed alignment. None of the alignments would affect any designated landmark or known archaeological site or properties on or eligible for the National Register at Historic Places.

Although there are differences in the relative geological, seismological and hydrological impacts of the three proposed routes, these differences would not have noticeably different physical effects. Especially with regard to the impacts of geological differences

(mainly landsliding) and of hydrological differences (mainly erosion during construction and silting of the drainage system), mitigation measures could make the net impacts identical.

2. Dissimilar Impacts

a. Visual

Because each proposed alternative alignment would pass through a somewhat different cityscape, the visual impact of the permanent physical structures (overhead lines and support standards) and of the LRV traffic itself would result in different impacts for each proposed alignment.

The overall visual impact of LRVs in the proposed Mission Street Alignment would be influenced by the existing trolley bus wires and by the background of visual elements, which would tend to mask the additon of new permanent physical structures. The street is frequently traversed with buses and larger trucks, so the LRVs would not introduce an entirely new dimension of vehicle. The adjoining properties are generally more commercial than along the other alignments; therefore, the general visual impact, and, specifically the impact on the view from the second story of the streetfront structures would be less than for the other two alignments.

The San Jose Avenue Alignment and the Monterey Boulevard Alignment would both pass through the Bernal Cut (see Figure 4, page 22). The San Jose Avenue Alignment would traverse the entire length of Balboa Park, which would affect the view from the houses on the opposite side of the street opposite the park. In the City College loop section of the Monterey Boulevard Alignment, the permanent physical structures would have to be above ground; all other utilities are currently underground in this area, except on Gennessee Street.

The City College loop of the Monterey Boulevard Alignment represents the most intensive concentration of residences along any of the proposed routings.

b. Energy

Energy consumption during the construction phase would vary among the alternative alignments from 570 billion BTUs (the equivalent of 103,000 barrels of oil)[3] for the San

Jose Avenue Alignment, to 740 billion BTUs (133,000 barrels of oil) for the Mission Street Alignment, to 900 billion BTUs (162,000 barrels of oil) for the Monterey Boulevard Alignment. Once in operation, Muni would require for the San Jose Avenue Alignment an additional 5.8 billion BTUs (1,000 barrels of oil), for the Mission Streeet Alignment, an additional 15.5 billion BTUs (2,500 barrels of oil), and for the Monterey Boulevard Alignment, an additional 20 billion BTUs (3,600 barrels of oil).

In terms of percentage of the energy consumption for the San Jose Avenue Alignment, the least energy-consumptive alternative, the Monterey Boulevard Alignment, would consume 156% more energy during the construction phase and 360% more per year of operation. The Mission Street Alignment would consume 114% more energy in construction and 280% more per year in operation than would the San Jose Avenue Alignment.

c. Traffic

The three proposed build alternatives would also have differing traffic impacts. The City College loop of the Monterey Boulevard Alignment would present few problems regarding volume of traffic and detour alternatives during the building phase, as would the sections of the San Jose Avenue Alignment south of the I-280 undercrossing. For both of these alternatives traffic circulation would be impeded in the Bernal Cut segment because of the high volume and lack of detour possibilities. Construction on Mission Street would be hampered by the general traffic volume, the narrowness of the street in many places, and the inability to detour electric trolley buses temporarily or provide substitute diesel service.

After completion, mixed LRV/trolley and diesel bus traffic would measurably slow traffic on Mission Street, as would the car-stop islands. Parking spaces on this and on the other proposed alignments would have to be removed to facilitate traffic flow. In the City College loop, a one-way street patten may be implemented to speed traffic. On the Monterey Boulevard Alignment, high-speed automobile accidents could result from a derailment or blockage by an LRV at the I-280 off-ramp. At the San Jose Avenue/I-280 undercrossing, introduction of LRVs in the median would slow traffic measurably.

Along certain segments of the Mission Streeet and Monterey Boulevard Alignments, the LRVs would duplicate existing transit facilities. This duplication would increase transit

vehicle frequencies and transit capacity. However, due to limited capacity of the system overall, this duplication could result in reduced vehicle frequency on other segments and generally less expansion of other route possibilities.

The impacts on pedestrian traffic would be similar but distinguishable for each alternative. In every case, the introduction of LRV traffic would tend to slow automobile traffic, thus benefitting the pedestrian. Traffic speed would be reduced where car-stop platforms are built; however, where no such islands are built, persons boarding or leaving the LRVs at mid-street stops would be exposed to on-coming traffic. At City College, on the Monterey Boulevard Alignment, and at 30th and Mission Streets, on the Mission Street Alignment, heavy pedestrian traffic may interefere with LRV movement.

Bicycle traffic would be affected if the LRVs were routed along the outside lane of San Jose Avenue. Otherwise, all proposed routings would present similar problems to cyclists: namely, the danger of the track flange and the danger of skidding on wet track.

d. Economic and Fiscal

The San Jose Avenue Alignment would generate a net savings in revenue for the Muni system, while the Monterey Boulevard and Mission Street Alignment alternatives would result in higher net costs. The San Jose Avenue Alignment with 12 minute headways south of 30th Street could be expected to show the greatest savings. For the purposes of this report, the analysis is based on the assumption that Muni would fund 100% of operating costs and that UMTA would finance 80% of the capital costs.

3. No-Build Alternative

Construction and operational costs would be saved, though the potential for a system-wide net savings would be lost. Transit service would continue as at present, however, there would be no cross-town streetcar service to major activity centers from the eastern part of the City.

Some impacts, such as those in air quality, vegetation, parks, archaeology, public services and utilities, reduction in use of the private automobile, growth inducement, displacement and relocation, and land use would not present measurable differences

between any of the three proposed alignment alternatives and the No-Build Alternative. However, the No-Build alternative would not further the objectives and policies of the Transportation Element of the Comprehensive Plan which calls for improving transit as the primary mode of travel between the downtown and all major activity centers. Consistency with Existing Plans and Policies). The No-Build alternative would also preclude streetcar access to Balboa Park.

---

[1]San Francisco Municipal Railway, Transportation Project: Planning, Operations, Marketing New Track Linkage N-J Lines, October, 1977.

[2]A grade separation at Randall Street and San Jose Avenue was considered in order to preserve the capacity of that intersection. SUch a structure would cost on the order of $5 million, which was determined to be an excessive amount for this project and has, therefore, been eliminated from further consideration.

[3]Since energy consumption may be made up of various components (i.e., hydroelectric, gas, gasoline, etc.) it is common practice to express the amount in a common term (i.e., British Thermal Unit, or BTU). Since many readers may not relate directly to BTUs, an equivalent energy value in barrels of oil is also given.

III. AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

A. LAND USE AND URBAN DESIGN

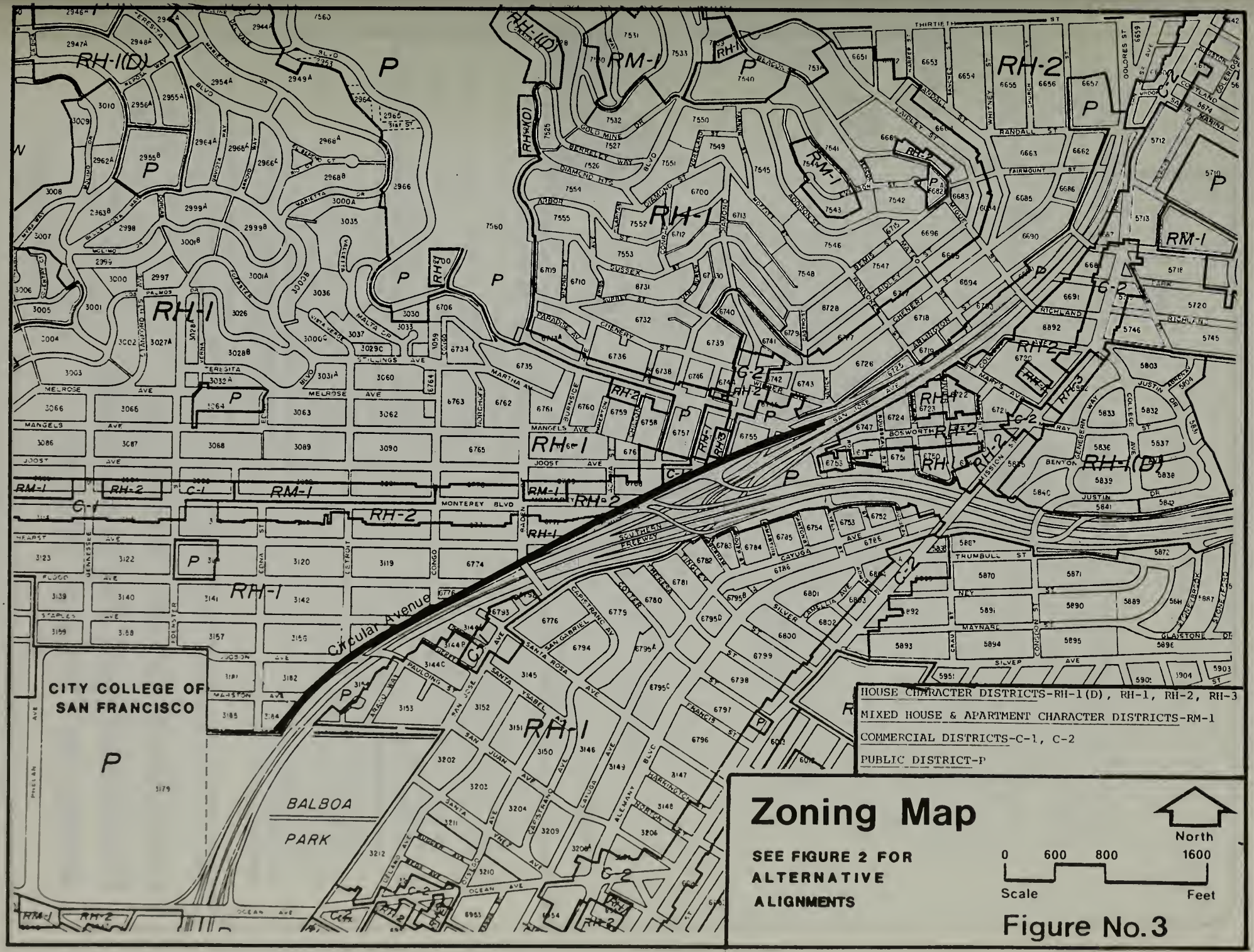
1. Land Use and Zoning

a. Zoning Classification and General Plan Designation

The alignments of the alternative connections are located in the public rights-of-way. The San Jose Avenue Alignment traverses public (P), single family and two family residential districts (RH-1 and RH-2) and commercially zoned districts (C-1 and C-2). The Mission Street Alignment traverses single family, two family and three family residential districts (RH-1, RH-2 and RH-3) and commercially zoned districts (C-1 and C-2). The Monterey Boulevard Alignment passes through single family, two family, three family and low density residential districts (RH-1, RH-2, RH-3 and RM-1 respectively). This alignment also traverses public (P) and commercially zoned districts (C-1 and C-2). In some instances an alternative alignment would run on the edge of two zoning districts. This occurs in a few places on each of the alignments: on the San Jose Avenue Alignment at Balboa Park and near Santa Rosa Avenue; on the Mission Street Alignment near Randall Street, at Cuvier Street and along Ocean Avenue at Cayuga and Delano Avenues; and on the Monterey Boulevard Alignment, near Monterey Boulevard. The General Plan designation in the corridor area is basically the same as the zoning classifications. Zoning classifications and General Plan designations for the study area are shown in Figure 3, page 21.

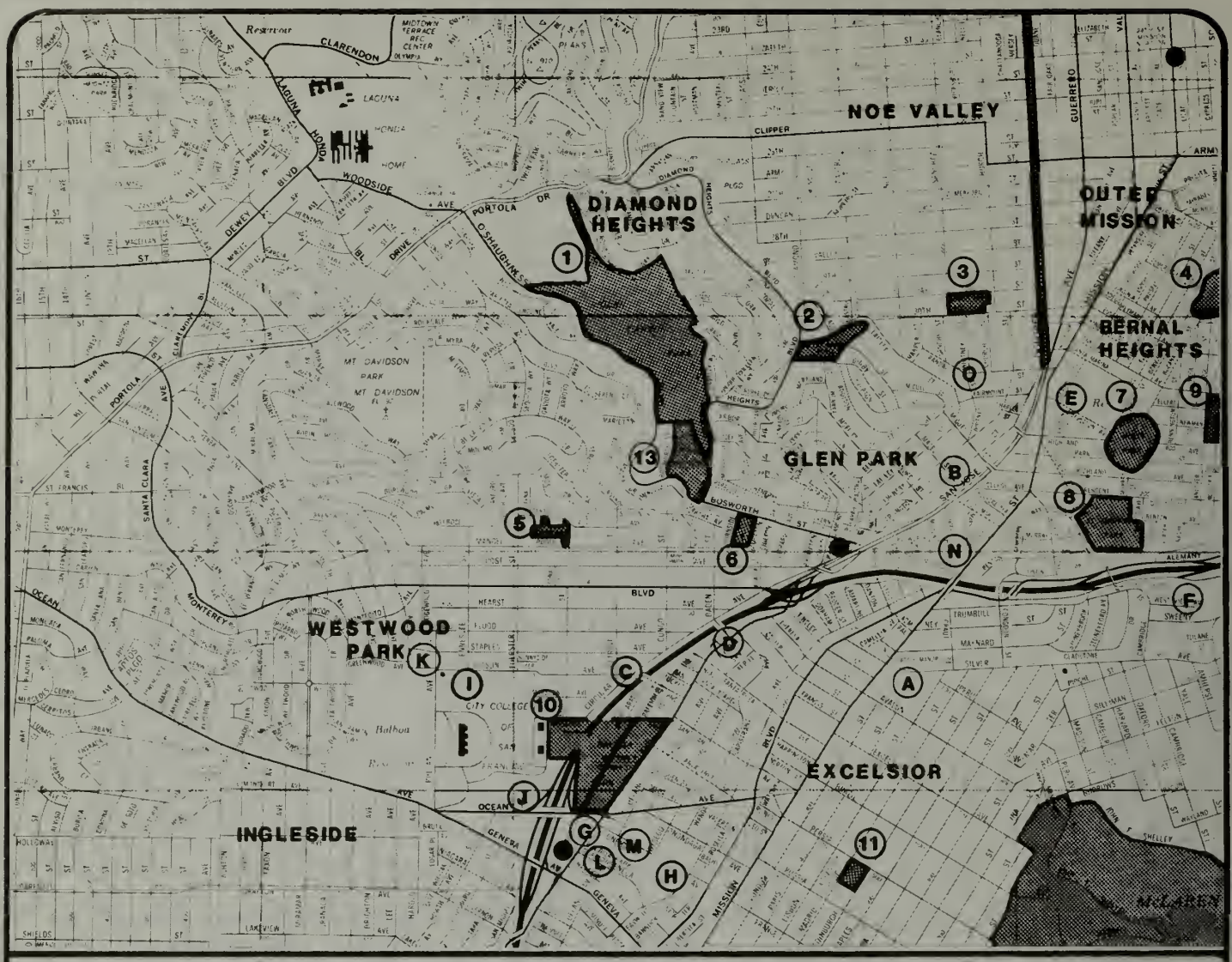
b. General Corridor

The neighborhoods which either adjoin or are partially affected by the project alternatives include Bernal Heights, Excelsior, Outer Mission, Ingleside, Westwood Park, Glen Park and Noe Valley (see Figure 4, page 22). The project corridor area extends from approximately 30th Street on the north to Geneva Avenue on the south and includes the areas adjacent to and between San Jose Avenue and Mission Street. The area between Monterey Boulevard and Phelan and Ocean Avenues is also included.



Zoning Map

Figure No. 3



1- GLEN CANYON PARK
2- WALTER HAAS PLGD.
3- UPPER NOE REC. CTR.
4- BERNAL HEIGHTS PARK
5- SUNNYSIDE
6- FUTURE PARK
7- HOLLY PARK
8- ST. MARY'S PARK REC. CTR.
9- BERNAL REC. CTR
10- BALBOA PARK
11- EXCELSIOR PLGD.
12- McLAREN PARK
13- GLEN PARK REC. CTR.

A- JEWISH HOME FOR THE AGED
B- BERNAL CUT
C- CIRCULAR AVE.
D- PILGRIM AVE
E- APPLETON AVE.
F- I-280
G- MUNI METRO CTR.-BALBOA PARK BART Station
H- BALBOA HIGH SCHOOL
I- CITY COLLEGE
J- LICK WILMERDING HIGH SCHOOL
K- RIORDAN HIGH SCHOOL
L- SAN MIGUEL ELEMENTARY SCHOOL
M- JAMES DENMAN JUNIOR HIGH SCHOOL
N- ST. JOHN'S HIGH SCHOOL
O- FAIRMOUNT ELEMENTARY SCHOOL

Neighborhoods, Schools, Parkland and Recreational Areas In Project Vicinity

North

0 500 1000 2000

Scale Feet

Figure No. 4

All of the neighborhoods in the corridor area are single- and multi-family residential with some commercial and institutional uses occurring along major arterials. The largest amount of commercial use in the corridor area occurs along the Mission Street Alignment. Much of the northeastern portion of the corridor begins in the southern part of the Noe Valley and goes through the Bernal Cut area between the steep slopes of the Bernal Heights and Diamond Heights. South of I-280 the corridor proceeds through the Excelsior District along the slope of the McLaren Park and Outer Mission towards the Ingleside community. The Westwood Park and Glen Park neighborhoods adjoin the north side of I-280 between the Ingleside and the slopes of the Diamond Heights area. The largest nonresidential land uses in the corridor include City College, Balboa Park, the Muni Metro Center, Balboa High School, the Jewish Home for the Aged and the I-280 freeway. John McLaren Park is located just east of the Excelsior District.

c. San Jose Avenue Alignment

The primary land uses adjoining the 30th Street segment of the San Jose Avenue Alignment consist of two-story detached and attached single- and two-family homes. As the Alignment turns the corner from 30th Street onto San Jose Avenue, it is bordered on the west by the rear yards of a row of two-story attached single- and two-family homes between 30th and Randall Streets. The east side of the street is bordered by the front yards and entrances to attached single- and two-family structures. As the alignment proceeds into the Bernal Cut area it is adjoined on the northwest by the base of the Diamond Heights ridge and on the southeast by the base of the Bernal Heights slopes. The segment of the alignment in the Bernal Cut area (from about Appleton Avenue to east of the I-280 underpass) takes on the characteristics of an exclusive transportation corridor due to the nature of the topography, the open space along the adjoining slopes, the absence of adjacent commercial or residential uses and general proximity to I-280. The right-of-way of San Jose Avenue includes a bicycle path which parallels the north side of the street. Due to the steep slopes bordering this segment of the alignment, residential properties are located approximately 50 to 70 feet above San Jose Avenue and back from the roadway.

The closest residential structures to this segment of the alignment are located on Bosworth Street overlooking San Jose Avenue.

West of the I-280 underpass to Pilgrim Avenue, the I-280 freeway is located adjacent to the north side of San Jose Avenue. There are single-family attached and detached homes along the south side of San Jose Avenue from the underpass to Ocean Avenue. The George Washington Masonic Hall is located at the corner of San Juan Avenue on the south side of the alignment. There is a fairly new apartment building with about 20 units on the north side of the street between Pilgrim Avenue and Baden Street. West of Pilgrim Street on the north side of the street is a mix of attached single-family structures, apartments and some commercial uses near Santa Ysabel Avenue. The Community Assembly of God, Medical Dental Building and Shell Oil are all located near Santa Rosa Avenue.

Further west, between Havelock Street and Ocean Avenue, is Balboa Park and swimming pool and the Ingleside Police Station. Balboa Park, the Muni Metro Center and the Balboa Park Bart station are the land uses adjoining Ocean Avenue south of the I-280 freeway. The land uses adjacent to the east side of San Jose Avenue south of Ocean Avenue include attached homes, the San Miguel School of Bilingual Education, a coffee shop, the old Muni carbarn and the Turko Persian Rug Company.

d. Monterey Boulevard Alignment

Land uses adjoining the Monterey Boulevard Alignment from 30th Street and San Jose Avenue to approximately Roanoke Street in the Bernal Cut area are the same as those adjoining the San Jose Avenue Alignment in the same area.

The Monterey Boulevard Alignment departs from San Jose Avenue at approximately Roanoke Street, and proceeds along the north slope of San Jose Avenue and I-280 to Monterey Boulevard. Land use along this segment includes San Jose Avenue and the I-280 freeway on the south and primarily single-family homes along the north side of Circular Avenue. A few commercial uses are located near the intersection with Mangels Avenue.

Along Monterey Boulevard between Circular Avenue and Foerster Street the adjacent uses consist of a mix of condominiums, apartments and single-family homes, primarily on the north side of the street, and attached single-family homes on the south side of Monterey Avenue between Acadia and Baden Streets. Several commerical uses, the largest of which is a Safeway store, are located between Foerster and Gennessee Streets in addition to single-family and attached residential. There are several commercial uses at the intersection of Gennessee Street and Monterey Boulevard.

The segment of Gennessee Street from Monterey Boulevard to Judson Avenue is bordered by attached single-family homes. At the Gennessee Street and Judson Avenue intersection, San Francisco City College is located to the south of Judson Avenue and Riordan High School is located on the east side of Phelan Avenue north of Judson. From the high school to Ocean Avenue, the other uses along Phelan Avenue include City College on the east and the old water reservoir areas on the west (currently used for City College surface parking). South of the reservoir is the California Book Store and a San Francisco Fire Department Station on the corner of Phelan and Ocean Avenues.

e. Mission Street Alignment

The majority of the Mission Street Alignment occurs along a commercial strip with some institutions, apartments and attached single-family structures scattered along the route. Access for this neighborhood commercial district is provided by foot, transit, and automobile. Most businesses are small and provide no off-street parking.

The segment of the Mission Street Alignment from San Jose Avenue to Randall Street is adjoined by some single-family attached homes on 30th Street, a Chevron gas station and the 30th and Mission Market located on the southwest and northwest corners of 30th and Mission Streets, respectively. From 30th Street to Randall Street there are several commerical establishments, most with apartments above. At the intersection of Mission and Randall Streets a Shell gas station is located on the north side of the Alignment.

As the Alignment proceeds west toward the I-280 overpass there are a variety of scattered commercial and two- and three-story apartment buildings along each side of Mission Street. At the Mission Street/College Avenue/Crescent Avenue intersection is the main entrance to the Saint Mary's Park residential area. This is a cohesive and established neighborhood of single-family detached homes bordered by the I-280 freeway on the west, by Crescent Avenue on the east and by Mission Street on the north. Some residential, commercial and institutional uses occur along the Mission Street side of this neighborhood, including the St. John's School for Girls near Bosworth Street and the Mission Street YMCA located on the north side of Mission Street near Bosworth Street. The segment of Mission Street from south of the I-280 freeway to Ocean Avenue has densely commercial use. The most prominent institutional land use occurring in this segment is the Jewish Home for the Aged and Disabled, located between Silver and

Avalon Avenues on the east side of Mission Street. This facility was one of the first buildings in the area and it was incorporated on the eight-acre site in 1889. The current resident population is 335. An 82-bed addition under construction east of the existing building is scheduled to open in late 1982. At Cotter Street not far from the Jewish Home for the Aged is the Social Security Office located on the east side of Mission Street. The Excelsior Branch Library is on the west side of the street.

Along Ocean Avenue from Mission Street to San Jose Avenue there is a mixture of residential and commercial uses. Most of the residential is single-family attached with some apartments located above commercial uses on the ground floor. Some of the commercial uses along this segment include: the Bank of America and Alex's San Francisco Health Club, between Persia Avenue and Alemany Boulevard; the Discovery Center School and Midas Muffler between Cayuga Avenue and Alemany Boulevard; and the Carpet Corner, Dome Construction and the Brentwood Market, between Otsego Avenue and San Jose Avenue.

2. Urban Design and Visual Quality

The proposed Muni J Line Connection would pass through a well-established urban portion of San Francisco and would use the existing street pattern and rights-of-way. This portion of the City is primarily residential, with heavy commercial development along Mission Street. The majority of residences are two-story single-family units, although some mid-rise apartment buildings are interspersed in the area. Most of the structures are built up to the sidewalk's edge with no vegetation buffer between the street and the living quarters. Like many residential structures in San Francisco, the ground floor of such buildings is generally used as garage and utility areas, with living quarters on the second floor. Because of this type of architectural design, the overall views of the street or the City from the higher levels becomes an important and pleasing feature of the structures. The visual quality of these views, and the amount of obstruction by existing utility lines and structural supports, varies along each of the three proposed alignments.

a. San Jose Avenue Alignment

The proposed San Jose Avenue Alignment would follow San Jose Avenue north from the Metro Center. The first three quarters of a mile of this route has a residential quality. Balboa Park, with its expansive lawn and mature Monterey cypress, is sited on the west

side of San Jose Avenue. The east side of this portion of the route is lined with single-family residences. Views from the second-story living quarters of these residences look out onto the park. They are only slightly obstructed by the utility poles and wires on the east side, and the street lights that line the park's edge. Upon reaching I-280, San Jose Avenue goes through an underpass and continues 50 to 70 feet below the surrounding neighborhood for approximately three quarters of a mile. Textured retaining walls, and planted slopes and median add visual interest to this portion of the street. Street lights with underground wires line both sides of San Jose Avenue. The Glen Park BART station lies on the west side of San Jose Avenue along Circular Avenue, a pedestrian overpass crosses San Jose Avenue to allow pedestrian access. North of the intersection of San Jose Avenue and Dolores Street, residences line both sides of the proposed route. Views from the second-story living quarters of these residences are typical short-range urban views of streets and buildings generally obstructed by other structures. By burying all utility wires on this portion of San Jose Avenue, the visual presence of utility wires clutter often associated with urban views has been removed. Street lights placed in the center concrete median are the only vertical elements in view along the avenue. The proposed alignment would travel westward on 30th Street to join with the existing Church Street terminus. Thirtieth Street is a narrow street, lined on both sides with single-family residences and mid-rise apartments. Utility poles carrying three sets of wires line the north side of the street and are within the field of view from the second-story living quarters of residences.

b. Monterey Boulevard Alignment

The proposed Monterey Boulevard Alignment would follow the existing K Line streetcar tracks along Ocean Avenue to Phelan Avenue at the west end of the City College of San Francisco. Phelan Avenue is a broad avenue with a center median, bordered to the east by the planted edge of the City College campus and to the west by a sunken parking area and Riordon High School. Street light standards are the only vertical element along the street, resulting in a visually uncomplicated avenue. The alignment would turn on Judson Avenue, then travel northward along narrow Gennessee Street through an area of single-family residences. Views from the second-story living quarters of these residences include the utility wires and vertical wire supports that line this street. After reaching Monterey Boulevard the proposed alignment would travel westward along this broad avenue. Monterey Boulevard is lined on both sides with apartments and single-family

residences. The center median along the length of Monterey Boulevard is planted with shrubs and groundcovers adding visual interest as well as separating the directions of travel. Views from the second-story living quarters along this avenue are typical of urban views; however, they do not include utility wires or support poles since utility wires are buried in this area. After reaching Circular Avenue, views from the second-story living quarters become longer-range across I-280 southeast toward nearby hillsides, including McLaren Park. The views do not include utility lines since the wires are buried in this portion. From Circular Avenue the proposed alignment would follow the San Jose Avenue Alignment discussed above.

c. Mission Street Alignment

The proposed Misson Street Alignment would follow Ocean Avenue east from the Muni Metro Center. This Alignment is currently the route for electrically powered buses and is lined with the overhead electric wires necessary for the buses' power system. This portion of Ocean Avenue is predominantly commercial, with some residential apartment structures interspersed. Views from the structures along Mission Street are restricted urban views confined by the structures that line it. At Mission Street, the proposed alignment would travel northward for three quarters of a mile through the Outer Mission commercial shopping district (Figure 4, page 22). Apartments and single-family units interrupt the predominant commercial use north of the I-280 overpass for approximately one quarter of a mile. Views from these residences are typical urban views of streets and buildings, interrupted more by the proximity of other structures than by the existing power line system for the buses. North of Randall Street, Mission Street becomes a predominantly commercial street once again. At 30th Street the proposed alignment would travel westward along the same route as the proposed San Jose Avenue Alignment to meet the existing Church Street terminus.

B. SOCIOECONOMIC CHARACTERISTICS

1. Population

The population within the project corridor has been very stable during the past ten years (population net increase of 84 persons) and is expected to remain so in the future. In comparison, overall population within the City declined 5.1% (36,700 people) between

1970 and 1980.[1] The stabilized condition in the corridor area is due in part to the fact that there have been few physical changes during this period. There is an absence of vacant land for development and many of the neighborhoods have reached a growth peak, given present zoning. Most of the population changes in the corridor area took place during the early 1960s prior to the construction of the I-280 freeway and BART.

2. Public Services and Utilities

a. Fire[2]

Five fire stations serve the Muni J Line Connection study area:

Station 11	26th and Church Streets
Station 15	1000 Ocean Avenue
Station 26	80 Digby Street
Station 32	194 Park Street
Station 43	720 Moscow Street

Engine companies in these residential areas have an emergency response time of four to five minutes.

b. Police[3]

The project area is served by 24-hour patrol cars originating from Ingleside Station located in Balboa Park. A foot patrol along Mission Street supplements patrol cars.

c. Parks or Other Recreational Facilities (see Figure 4, page 22)

Several parks are in close proximity to the three proposed alignments. However, only one park is adjacent to a line. Balboa Park at San Jose Avenue and Havelock Street is a 27.5-acre city park. The park contains four baseball diamonds, four tennis courts, one regulation soccer field with pressbox, stands and snack bar, a playground, a swimming pool, bike racks, and playing field. Ingleside Police Station is located in Balboa Park on Sergeant John Young Street.

d. Schools (see Figure 4, page 22)

Each of the proposed alignments passes near Fairmount and San Miguel Elementary Schools, James Denman Junior and Balboa Senior High Schools. In addition, the Mission

Street Alignment passes by John's High School for Girls and the Monterey Boulevard Alignment lies adjacent to Riordan High School, City College and Lick Wilmerding High School.

e. Power and Natural Gas

Street lamps along the alignments are powered by Hetch Hetchy Water and Power. However, the power is delivered through the PG&E distribution system.[4] Underground and overhead electric lines and buried gas mains are Pacific Gas and Electric facilities.

f. Communication Systems

Underground and overhead telephone service lines are provided by Pacific Telephone and Telegraph Company. Cable television underground and aerial lines are provided by Viacom Cablevision.

g. Water

Water for San Francisco is provided from the Hetch Hetchy project and the San Francisco Water Department system via the Crystal Springs and San Andreas Reservoirs. Low and high pressure water mains run under streets along the proposed alignments.

h. Sewer and Storm Water Drainage

San Francisco Department of Public Works maintains the sewage facilities in the City. Underground sewer lines of various sizes lie beneath the streets comprising the three proposed alignments.

i. Solid Waste

Sunset Scavenger Company collects solid waste in the project area. Refuse is brought to a transfer station west of Candlestick Park before its final destination, the Mountain View Landfill.

The disposal company has a contract for the landfill site which expires in October 1983, after which San Francisco's solid waste would go to a landfill site at Altamont in Alameda County. The City is also considering the long-term solid waste disposal possibility of a waste energy plant at the existing transfer station in Brisbane.

3. Economic and Fiscal

San Francisco Municipal Railway budget for the 1981-82 fiscal year is $142,321,686.[5] This represents an increase of approximately $18.0 million over actual expenditures in the 1980-81 fiscal year. The proposed budget for the 1982-83 fiscal year represents an additional $16.0 million increase. The sources of revenues are shifting toward farebox revenues and local operating assistance and away from state and federal subventions. In the 1980-81 fiscal year, state and federal subventions accounted for 28% (14% each) of the budget and would constitute 22% of the proposed 1982-83 budget. In its five-year plan, Muni estimates the proportion of the budget defrayed by state and federal sources will decline to 16% by 1986-87. Farebox revenues have fluctuated between 33% and 40% of the budget in recent years and are required to remain at not less than 33% by AB1107. Given this distribution of federal, state and farebox revenues, and a reasonable growth in general fund revenues, a deficit is projected in 1986-87 which would have to be made up by as yet unspecified local sources.[6]

C. TRANSPORTATION

1. Traffic Conditions

a. General Conditions

The J Line Connection Corridor includes San Jose Avenue and roughly parallel streets between 30th Street and Geneva Avenue. In the north the corridor is narrow where it passes through a gap (known as the Bernal Cut) between the steep slopes of Bernal Heights and the Diamond Heights ridge of Twin Peaks. In the south it widens out into the Outer Mission, Sunnyside, Ingleside and Excelsior Districts, which occupy the valley between the moderate slopes of University Mound (McLaren Park) and Mount Davidson. This topography funnels traffic from the southern third of San Francisco and the west side of northern San Mateo County through either the gap or the Islais Creek Valley between Bernal Heights and University Mound. San Jose Avenue, which occupies an old Southern Pacific Railroad right-of-way in the Bernal Cut, and Mission Street serve traffic in the gap, while the I-280 freeway (which also utilizes an old railroad right-of-way) occupies the Islais Creek Valley.

There are two entrances/exits to I-280 in the J Line Connection Corridor: a modified diamond interchange at Geneva and Ocean Avenues; and a four-level interchange at Glen

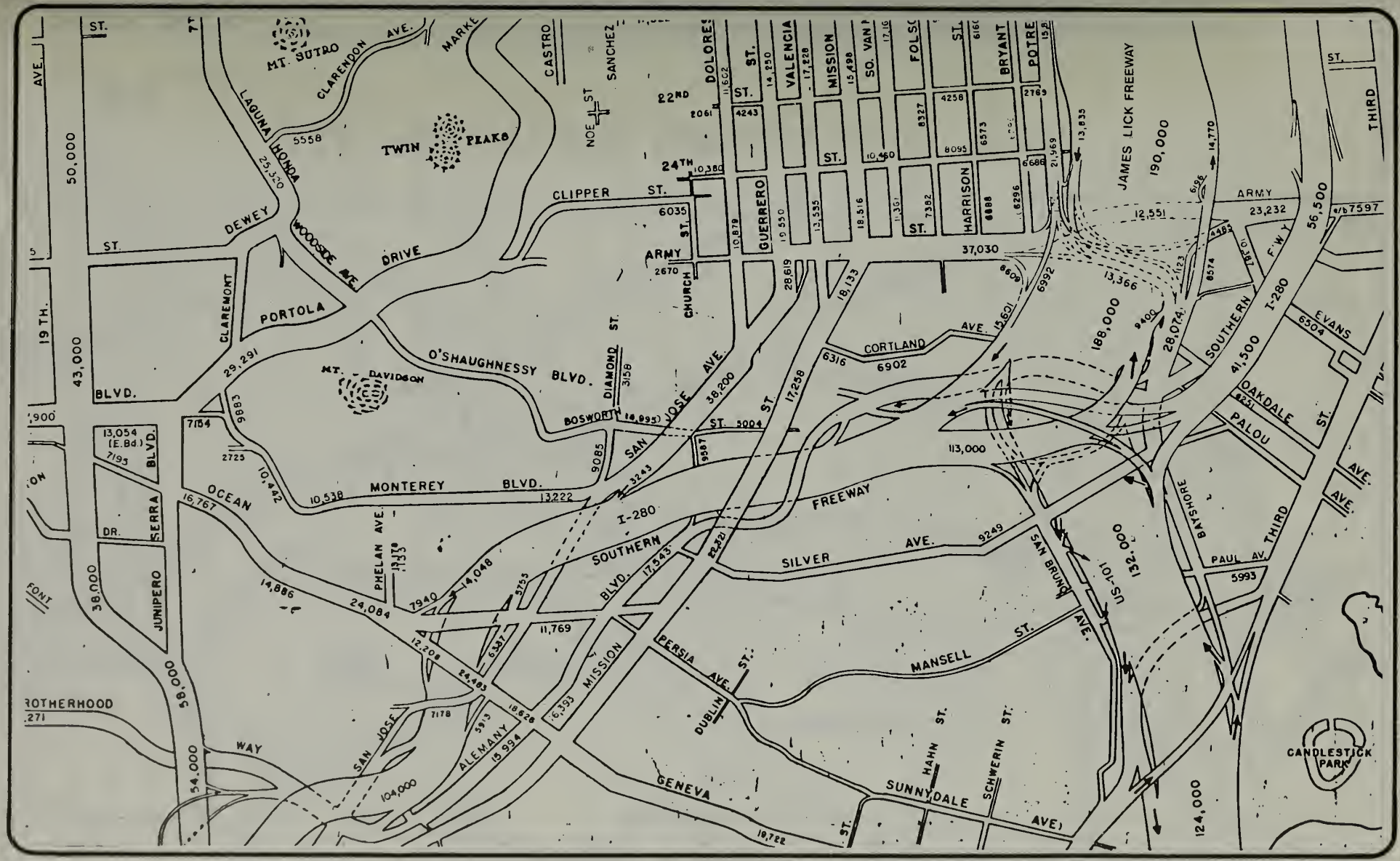
Park with ramps connecting between southbound I-280 and Monterey Boulevard to the west, between northbound I-280 and San Jose Avenue to the north, between Monterey Boulevard to the west and San Jose Avenue to the north, plus a through connection for San Jose Avenue. Both freeway entrances are adjacent to BART stations: Balboa Park Station at Geneva/Ocean Avenues and Glen Park Station at Monterey Boulevard/San Jose Avenue. The result is that during peak hours the heaviest traffic volumes on the surface streets in the corridor are associated with these freeway entrance and BART station areas. Muni transit routes converge at the stations; thus buses and Muni Metro vehicles as well as pedestrians and kiss-and-ride patrons all contribute to the congestion at these areas. BART has proposed and received approval from the City of San Francisco for a kiss-and-ride lot for the Glen Park BART station, which would help mitigate congestion around this station.

Traffic Volumes. The I-280 freeway, built in the 1960s, handles most of the through travel. Figures 5 and 6, pages 33 and 34 show daily and p.m. peak hour traffic volumes in the corridor. In 1979 the freeway carried 133,000 vehicles on an average day (called average daily traffic and abbreviated ADT) between Ocean and San Jose Avenues and 125,000 ADT east of San Jose Avenue. San Jose Avenue north of I-280 to Randall Street functions as an expressway branch of the freeway carrying 38,000 ADT (1976 count). Both the freeway and San Jose Avenue in this section flow freely, except that the a.m. peak traffic in the eastbound lanes of I-280 backs up from the US 101 merge. This results in an imbalance in traffic flow on both Mission Street and San Jose Avenue in the Bernal Cut, with the a.m. peak northbound flow heavier than the return southbound flow in the evening. This daily directional split is 53 to 47 on San Jose Avenue and 60 to 40 on Mission Street.

b. San Jose Avenue Alignment

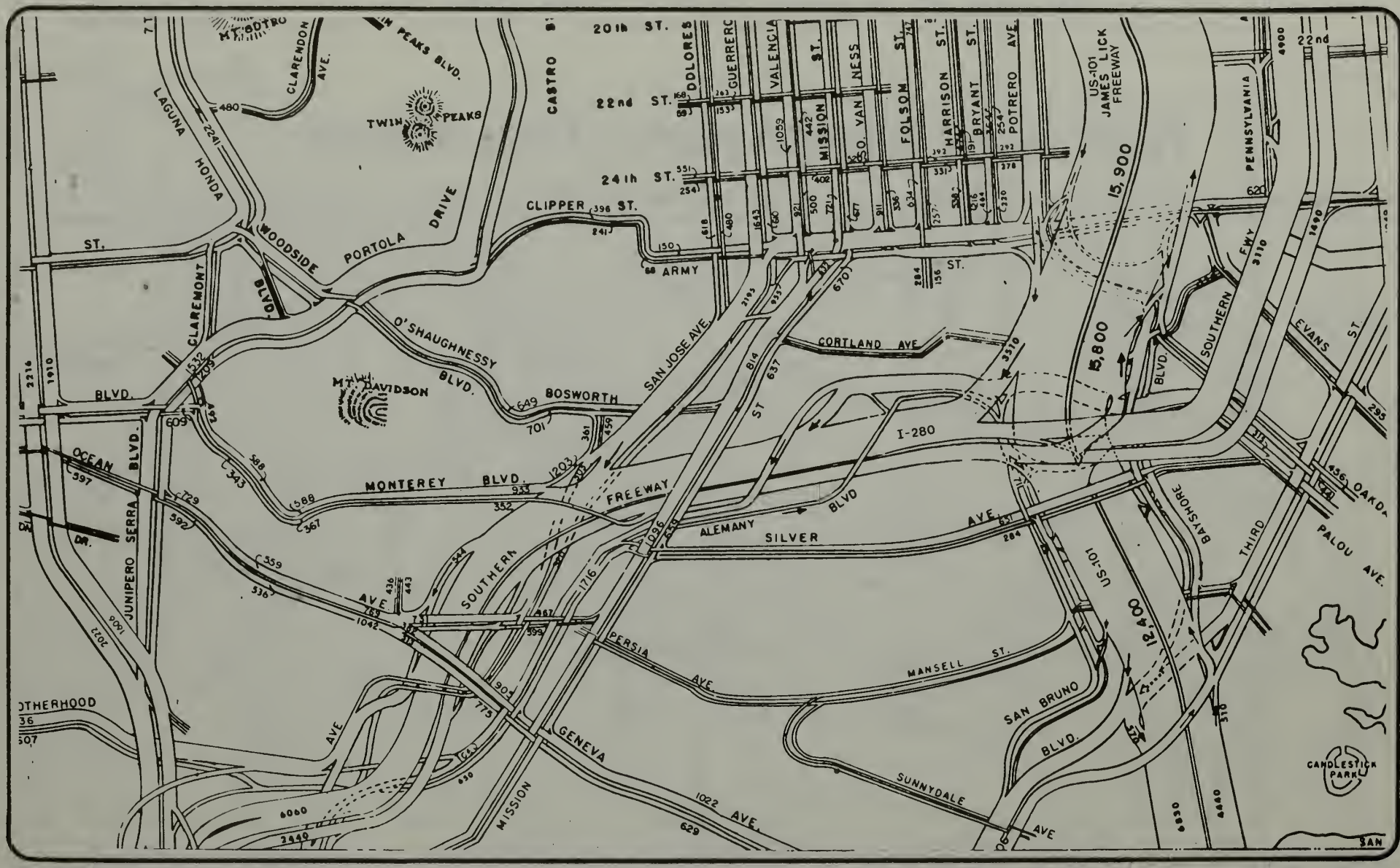
Appendix C, page A-9, inventories the existing street conditions and traffic volumes along the San Jose Avenue Alignment and for the subalternative, the Dolores Street Alignment. The traffic conditions segment by segment are:

- 30th Street is one lane each way plus parking; travel volumes are light.



Average Daily Traffic Volumes (1974-1976)

Figure No. 5 SOURCE: Division of Transportation, Bureau of Engineering, Department of Public Works, City and County of San Francisco.



North

0 1000 2000 4000

Scale Feet

P.M. Peak Traffic Volumes (1974-1976)

Figure No. 6

SOURCE: Division of Transportation, Bureau of Engineering, Department of Public Works, City and County of San Francisco.

- San Jose Avenue from its merge with Guerrero Street to the I-280 on/off ramps has three travel lanes separated each way by a median. (There are four traffic lanes in the short section between Dolores Street and 200 feet south of Randall Street.) Parking is not permitted on San Jose Avenue south of Dolores Street, except for an 800-foot stretch northbound between Rousseau Street and St. Mary's Avenue. Traffic volumes range from 29,000 ADT at 30th Street to 38,000 ADT in the Bernal Cut.

  The section of San Jose Avenue south of Randall Street functions as an expressway. It has a median, no crossing intersections, two grade-separated street crossings (Highland Avenue and Miguel Street), a grade-separated pedestrian crossing (Cuvier Street), freeway-style on-off ramps, freeway-style overhead signs, limited access and parking, and a 45-mph speed limit which was observed to be regularly exceeded.

- San Jose Avenue between the I-280 ramps and Theresa Street has one lane each way plus a center median. In this transition area between the expressway conditions to the north and the regular surface arterial to the south, San Jose Avenue makes an S-curve through the I-280 undercrossing. The geometry of this curve limits actual speeds (southbound) to 40 to 45 mph on the first curve and 30 to 35 mph on the second curve.

- San Jose Avenue between Theresa Street and Ocean Avenue is four lanes with parking on both sides. Traffic volumes are in the 10,000-ADT range. This section operates as a minor arterial and occasionally receives overflow from the freeway.

Traffic Signals. The two traffic signals on San Jose Avenue at 30th and Randall Streets are part of the Army-San Jose coordinated traffic signal system, which provides progressive traffic flow along Army Street, Guerrero Street and San Jose Avenue. This system of progressive signal timing has 80-second cycles in the peaks (7-8:30 a.m. and 4-6 p.m.) and 60-second cycles off-peak. Green time favors San Jose Avenue.

The other two traffic signals on San Jose Avenue (at Santa Rosa and at Ocean Avenues) operate independently. The Santa Rosa Avenue signal has a 55-second cycle and Ocean Avenue a 65-second cycle. Green time at both signals favors San Jose Avenue.

Bicycle Lanes. A two-way bicycle path shares the west side of San Jose Avenue through the Bernal Cut between Randall and Arlington Streets. This 10-foot-wide lane on the original street pavement is separated from San Jose Avenue traffic lanes by asphalt curbs. It is classified as a signed, Class I (off-road), bike path in the Transportation Element of the San Francisco Master Plan. The bike path is littered with trash and broken glass. The bicycle path is lightly used: A 1976 count observed four bicycles in the p.m. peak hour, and a count in May 1981 observed the same number. In the Master Plan, 30th Street is designated as a signed bikeway between Sanchez Street and San Jose Avenue, and between 30th Street and the north entrance to the San Jose Avenue bike path. Dolores Street southbound, and Randall and Chenery Streets northbound are also designated as signed as bikeways.

c. Monterey Boulevard Alignment

Appendix C, Page A-9, inventories the existing street conditions and traffic volumes for the Monterey Boulevard Alignment and for the subalternative, the Dolores Street Alignment. A general description segment by segment follows:

- Traffic conditions along 30th Street and San Jose Avenue from its merge with Guerrero Street to the I-280 on-off ramps are as described for the San Jose Avenue Alignment (Section III.C.1.b., page 35).

- The Monterey Boulevard on/off-ramps are single lane at the merge with San Jose Avenue but widen to two lanes at the intersection with Circular Avenue and Diamond Street.

- Circular Avenue carries approximately 16,000 vehicles daily. Between Diamond Street and Monterey Boulevard it is a four-lane street connecting the Glen Park Area and the Monterey Boulevard/San Jose Avenue on/off-ramps to the I-280 westbound on/off ramps, to Monterey Boulevard and to the remainder of Circular Avenue to the south. Parking is allowed only on the north side.

- Monterey Boulevard between Circular Avenue and Gennessee Street has 4 traffic lanes plus parking in some locations. Monterey Boulevard is one of the few east-west arterials in the southern part of the city, and it serves as a freeway connector for trips originating as far west as Sloat Boulevard and the West Portal

area. It carries about 13,000 vehicles per day. The street contains a barrier median, sidewalk bulbs for some of the eastbound bus stops and for some of the crosswalks, and curb cuts for parking and planting when possible. Buses stop in the outside lane both east and westbound. The street is hilly, with the steepest grade of 7.9 percent between Edna and Foerster Streets. The intersections of Edna and Baden Streets are four-way stops. The Safeway supermarket midway between Gennessee and Foerster Streets has midblock access.

- Between Monterey Boulevard and Phelan Avenue the J line could be routed over several streets. The streets in this residential neighborhood tend to be narrow -- most have a 60-foot right-of-way with 12-15 or 20-foot sidewalks, so the pavement widths vary from 30 to 40 feet; however, with eight-foot parking lanes on both sides, the travel way is limited to approximately 14-24 feet wide. Due to the proximity of City College, the parking supply tends to be saturated. Grades in excess of nine percent would limit the possible LRV alignments through this neighborhood to Gennessee Street or a combination of Gennessee/Judson and Foerster/Staples or Flood.

- Judson and Phelan Avenues front San Francisco City College and Riordan High School, which are primary traffic generators for these streets. San Francisco City College has a total population of 28,000 students evenly split between day and night classes, 1,000 faculty members, and 330 staff and administrative personnel. Riordan High School has approximately 1,000 daytime students and 60 staff and faculty. Both Judson and Phelan Avenues are 58 to 60 feet wide. Phelan Avenue, which has 13,000 ADT at Ocean Avenue, has an erratic flow pattern with surges based in large part on class schedules. During peak class-change periods, heavy congestion sometimes occurs, particularly where vehicles enter and leave parking lots. There are heavy pedestrian flows across Phelan Avenue both to and from the parking lots and to the transit vehicles.

- Ocean Avenue between Geneva and the Muni Metro Center entrance (opposite the eastbound I-280 on-ramp) is a major arterial with 4 lanes of traffic and LRV tracks in the median. It carries about 10,000 vehicles daily.

Traffic Signals. Section III.C.1.b., page 35, describes the two traffic signals on San Jose Avenue at 30th and Randall Streets.

The traffic signal at Diamond Street, Circular Avenue and the San Jose Avenue on/off ramps normally operates as a flashing red for the off-ramp and flashing yellow for Diamond Street and Circular Avenue. A pedestrian-activated signal provides a protected walk phase for the Diamond Street crosswalk.

The three-phase fixed-time traffic signal at Circular Avenue, Monterey Boulevard and the I-280 on/off ramps functions well.[7] After installation this signal was reconfigured and the I-280 off-ramp restriped to two lanes to prevent queues of cars from backing out onto the freeway.

The two traffic signals on Monterey Boulevard at Foerster and Gennessee Streets are timed to provide an 18-mph speed between them; this has helped reduce speeding along Monterey Boulevard.

Phelan and Geneva Avenues form an offset intersection with Ocean Avenue, necessitating a complex signal timing strategy. The central area of the intersection on Ocean Avenue is utilized as a "storage" area for vehicles from Phelan Avenue bound for Ocean Avenue eastbound, and for vehicles from Geneva Avenue bound for Ocean Avenue westbound. The capacity of this storage area is a critical factor in the signal timing. As currently configured, the most serious problem is the left-turn from Ocean Avenue (eastbound) to Phelan Avenue. Vehicles accessing City College via this left turn often have to wait through several signal cycles. Moreover, vehicles in the left-turn lane block eastbound LRVs. To improve this situation, a bypass road has been proposed by the Department of Public Works in the abandoned streetcar turnaround. The new roadway scheduled for construction in 1983, would connect Phelan Avenue just south of the bookstore with Ocean Avenue at Lee Avenue, thus moving the left-turn movements away from the Phelan/Ocean Avenue intersection to Lee Avenue.[8]

Due to the minimum of cross traffic, the traffic signal at Ocean Avenue and Howth Street functions well.[9] The LRV-activated traffic signal at the entrance to the Muni Metro Center protects the Muni Metro trains during pull-in and pull-out maneuvers. A train-length detector adjusts the length of the LRV phase to minimize inconvenience to motorists.[9]

Bicycle Lanes. For a description of the two-way bicycle path along the west side of San Jose Avenue through the Bernal Cut, see Section III.C.1.b., page 36.

d. Mission Street Alignment

Appendix C, page A-9, inventories the existing street conditions and traffic volumes along the 30th Street/Mission Street/Ocean Avenue Alignment. The traffic conditions segment by segment follow:

- 30th Street has one lane each way plus parking and curb bus stops; traffic volumes are light.
- Mission Street between 30th Street and Ocean Avenue has four traffic lanes. Traffic is moderately heavy (17,000 to 22,000 ADT), and transit volumes are heavy (39 to 43 buses per hour in the peak direction in the peak period). There is parking in most locations, and in the Excelsior District there is moderately intense commercial activity.

The street pattern along this section of Mission Street is chaotic, since the original San Francisco grid system stops at Bernal Heights. Most of the side streets are narrow and form T intersections with Mission Street. Moreover, except for the Excelsior District, there is no grid pattern to buffer the traffic flows; consequently, left turns are allowed at all locations. There are only two left-turn pockets: northbound at Randall Street and southbound at Trumbull Street (the I-280 freeway entrance). The numerous T intersections mean that local trips crossing Mission Street often require a zig-zag pattern, with the middle leg of the trip along Mission Street.

Between Cortland Avenue and Excelsior Avenue, traffic generally flows well, except from Cortland Avenue north and within the Excelsior commercial area, where there is often light to heavy traffic congestion.

- Ocean Avenue between Mission Street and San Jose Avenue is a generous two-lane, 40-foot-wide street. With 12,000 ADT, the traffic flows well, with the principal source of delay at the three signalized intersections which are unconnected (Mission Street, Alemany Avenue and San Jose Avenue).

Traffic Control. The 30th and Dolores Street intersection is a four-way stop. The 30th Street/San Jose Avenue traffic signal, part of the Army-San Jose traffic signal system, is described above in Section III.C.1.b. The 30th Street and Mission Street traffic signal is part of the Middle Mission traffic signal system (Precita Avenue to Cortland Avenue). As with the San Jose Avenue signal system, the Middle Mission has a 60-second off-peak and 80-second peak cycle length, but the two systems are not coordinated. The Cortland Avenue and Mission Street signal is coordinated with the one at 30th Street. A pedestrian-activated signal at Appleton Avenue does not belong to any signal system. From Richland Avenue south all the traffic signals are part of the Outer Mission system, including those at Richland Avenue, Bosworth Street, Trumbull Street, Silver Avenue, Excelsior Avenue, Norton Street/Brazil Avenue, and Ocean Avenue.

The spacing of these signals allows for excellent two-way traffic progression. The Ocean Avenue and Alemany Boulevard traffic signal is isolated (unconnected) and favors Alemany Boulevard, and likewise the Ocean Avenue and San Jose Avenue traffic signal is isolated and favors San Jose Avenue.

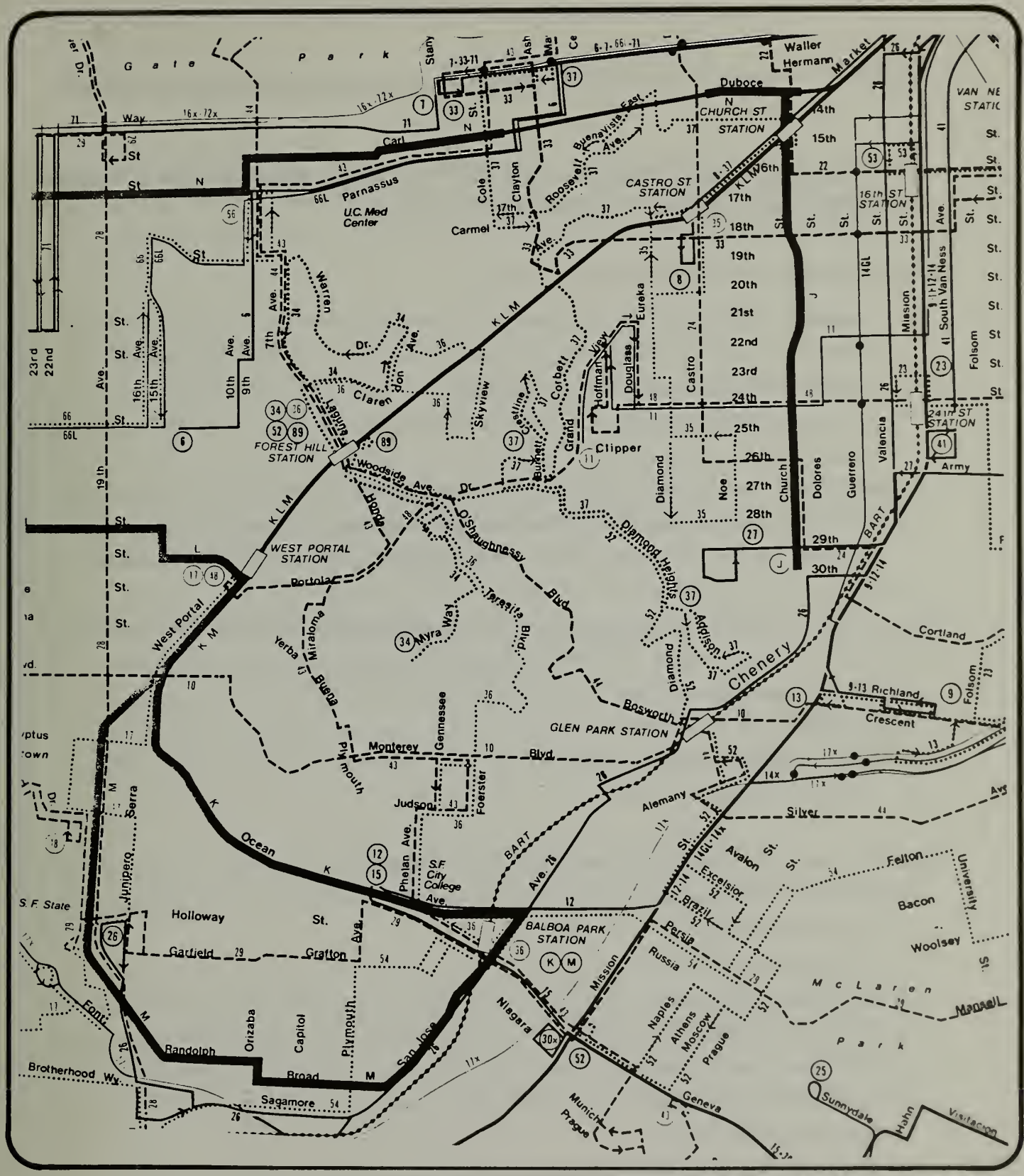
2. Transit Conditions

a. Existing Transit Service

Routes. The existing Muni and BART routes within the J Line Connection Corridor are shown in Figure 7, page 41. The J-Church Muni Metro (LRV) route currently operates between 30th and Church Streets and the Embarcadero Station at the foot of Market Street. The route operates on Church Street between 30th Street and Duboce Avenue, where it joins the N-Judah line to enter the Muni Metro Market Street subway.

The parallel Muni routes that would potentially be affected by one or more of the J Line Connection alternatives are the:

- 26-Valencia motor coach, which serves the outer part of San Jose Avenue.
- 9-Richland trolley coach on Mission Street north of Richland Avenue. In the 5-year Plan the 9-Richmond is scheduled to be discontinued.
- 12-Ocean trolley coach on Mission Street and Ocean Avenue.
- 14-Mission trolley coach on Mission Street.
- 14GL-Guerrero Limited and the 14X-Mission Express peak-hour only motor coaches that serve the Outer Mission. Both lines are scheduled to be abandoned when Muni Fast Pass is accepted as fare on BART.



Existing MUNI Routes

North

0 1000 2000 4000

Scale Feet

Source: MUNI, January 1982

Figure No. 7

- 10-Monterey motor coach, a crosstown line whose middle section currently parallels the Monterey J Line Connection Alignment.

Other parallel transit routes in the corridor are:

- Samtrans 5M Route, which operates closed-door service (can only pick up passengers outbound, and let off passengers inbound) on Mission Street between San Mateo County and downtown San Francisco
- Jitneys, privately owned vans with licenses from the city which serve Mission Street within San Francisco
- BART, which operates rapid transit trains between Daly City, downtown San Francisco and the East Bay. The two BART stations in the J Line Connection Corridor are the Glen Park Station and Balboa Park Station (Muni Metro Center).

Muni crosstown, feeder and radial routes in the corridor congregate at the BART stations, forming major transfer points. At the Glen Park BART station they are:

- 10-Monterey motor coach
- 26-Valencia motor coach
- 44-O'Shaughnessey motor coach
- 52-Excelsior motor coach

and at the Metro Center/Balboa Park BART Station they are:

- 12-Ocean trolley coach
- 15-Third motor coach
- 26-Valencia motor coach
- 29-Sunset motor coach
- 36-Teresita motor coach
- 43-Masonic motor coach
- 54-Fulton motor coach
- K-Ingleside Muni Metro
- M-Ocean View Muni Metro

There is a third transfer point at 30th and Mission Streets. Included here are the Mission Street routes (9, 12, 14), the 26-Valencia, and the 24-Divisadero motor coach, which is scheduled to be electrified.

Route. The existing scheduled service frequencies for the parallel routes and for the feeder and crosstown routes are shown in Table 2, page 44. Representative operating times for several origin destination pairs for routes in this corridor are shown in Table 11, on page 100.

b. Transit Patronage

The 1975 On-Board Survey patronage estimates of J Line Corridor routes developed by the POM Study are:

- J-Church streetcar, 17,400 daily boardings for the entire line north of 30th Street;
- 26 and 26X-Valencia motor coach, 9,700 daily boardings of which 3,000 were between Ocean Avenue and 30th Street;
- 9, 12, 14, 14L, 14GL and 14X Mission buses had 69,000 daily boardings of which 6,800 were between Ocean and Crescent Avenues, and an estimated 2,600 were between Crescent Avenue and 30th Street;
- 12-Ocean trolley coach, had 2,300 daily boardings along Ocean Avenue; and
- 10-Monterey crosstown motor coach, 20,000 total daily boardings, of which 2,500 were along Chenery Street and 1,400 on Monterey Boulevard east of Forrester Street.

The comparable 1975 BART patronage for the two stations in the corridor were 2,900 daily boardings at the Glen Park Station, and 2,800 daily boardings at the Balboa Park Station.

Between 1975 and 1981, BART patronage in the corridor increased 40%, and in 1981 the number of daily passenger boardings were 3,600 for Glen Park and 4,000 for Balboa Park. The increased growth for Balboa Park over Glen Park is due in part to the connection of the K and M Muni Metro routes, and in part as spill over from the Daly City BART station.

The 1975 On-Board Survey patronage estimates included route segment boardings for both the inbound and outbound directions. Appendix C, page A-13, shows the line boardings for those route segments that most closely approximate the 30th Street and Geneva Avenue end-points for the J line Connection. The combined daily corridor patronage for routes

TABLE 2
EXISTING TRANSIT ROUTE HEADWAYS
J-LINE CONNECTION CORRIDOR

Route	Scheduled Headway In Minutes						
	AM Peak	Midday	PM Peak	Eve.	Sat. Afternoon	Sun. Afternoon	Owl 1-5AM
MUNI METRO							
J - Church	6	6	6	10	14	16	30
K - Ingleside	6	6	6	10	15	10	60
M - Ocean View	6	6	6	10	15	20	-
PARALLEL ROUTES - MISSION STREET							
9 - Richland	8	9	8	-	-	-	-
12 - Ocean	8	9	8	16	16	12	-
14 - Mission	4	9	4	16	10	6	30
14L - Mission Limited	-	18	-	-	-	-	-
14GL - Guerrero Limited	15	-	15	-	-	-	-
14X - Mission Express	5	-	6	-	-	-	-
PARALLEL ROUTES - OTHER							
10 - Monterey	15	15	15	20	20	20	-
26 - Valencia	10	11	10	20	16	24	-
OTHER ROUTES							
13 - (Ellsworth)	20	20	20		-	-	-
15 - Third (City College Branch)	8	12	8	20	15	15	30
24 - Divisadero	8	10	8	20	15	15	-
29 - Sunset	12	15	12	20	15	15	-
36 - Miraloma	15	20	15	30	30	30	-
43 - Masonic	10	12	10	20	15	15	-
44 - O'Shaughnessy	7	10	8	20	11	20	-
52 - Excelsior	20	20	20	30	20	20	-
54 - Felton	20	20	20	20	20	40	-
BART	7	7	7	20	7	20	-

Source: MUNI Schedules 1/82

paralleling the J line Connection for Muni total 21,000 boardings for Muni and 8,000 boardings for BART, for a grand total of 29,000 boardings. In the San Jose Avenue/Chenery Street Corridor for the 26-Valencia bus, the inbound/outbound boardings are almost equal (51:49 directional split). The Mission Street buses are more inbound (downtown) oriented (68:32 directional split).

c. Muni 5-year Plan

Since the 1975 On-Board Survey, which forms the basis for the patronage projections of this study, there have been a number of transit route changes both as part of Muni's 5-Year Plan for route restrictions and as part of the construction of the Muni Metro System. Muni Metro, with the opening of the Market Street Subway and with the connection of the K and M lines to the Metro Center (Balboa Park Station) has altered travel patterns within the J Line Connection Corridor. The M line and BART have attracted so much patronage away from the 26X that it has been discontinued. In addition, there has been significant route restructuring of the crosstown and feeder service in the corridor, the impact of which has been to service better the Muni Metro Center/Balboa Park Station and the Glen Park Station. These stations have as a consequence become important transfer centers between Muni routes as well as to and from BART. The 10-Monterey route has been greatly altered west of Gennessee Street; however, between Gennessee and the Glen Park Station it still functions basically as it did in 1975 POM Survey. Except for the 26X, there has been no change in the downtown service in the corridor since the 1975 survey.

The January 1982 route changes relating to the J Line Connection Corridor include the connection of the 24-Divisadero south and east on Cortland Avenue Avenue over Bernal Heights. If the 5-year Plan to move the 26 line from Valencia to Guerrero in the Inner Mission is adopted, this would reduce the number of bus turning movements at the 30th and Mission Streets intersection but would introduce bus turning movements at the 30th Street and San Jose Avenue intersection.

The 5-year Plan also includes replacing the 9-Richland line on Richland/Crescent Avenues with the 10-Monterey midday, although in the near term the 9 line trolley coach may continue to serve peak periods.

D. NATURAL ENVIRONMENT

1. Climate and Air Quality

The climate of San Francisco is dominated by the characteristic breezes of a marine climate. Because of the steady stream of marine air, there are few extremes of heat and cold. Temperatures exceed 90°F on an average of once a year and drop below freezing on an average of less than once a year. The warmest month is September, with an average daily maximum of 68°F.

Winds in San Francisco are generally from a westerly direction and are persistent from May to August. During the rainy season (October to April), however, the strongest winds flow from the south as well as from the west and northwest.

San Francisco's persistent summer wind and its upwind position in relation to major pollutant sources give it possibly the cleanest air in the Bay Area. Despite these advantages, there are periods, most often in fall and winter, when the air becomes stagnant. At these times the entire Bay Area has poor air quality.

The prevailing wind pattern in the Bay Area results in a deterioration of air quality east and south of San Francisco. Table 3, page 47 shows that areas downwind of San Francisco have more severe air quality problems. The main San Francisco monitoring site is at the Bay Area Air Quality Management District offices at 900 23rd Street, about one-half to two miles northeast of the proposed alignment.

Air quality in San Francisco in 1981 did not violate air quality standards. San Francisco is therefore considered an "attainment" area with respect to state and federal air quality goals. However, state and federal standards are not met at several other locations in the Bay Area (see Table 3). This has resulted in the development of an Air Quality Plan for the Bay Area, as part of the Environmental Management Plan (EMP) prepared by the Association of Bay Area Governments (ABAG) and other governmental agencies as required by the Federal Clean Air Act, as amended.[10] The 1979 Air Quality Plan contains a strategy for the long-term attainment and maintenance of the air quality standards. The plan includes measures to reduce emissions from stationary sources and automobiles, and proposed transportation measures designed to reduce automobile emissions. The air quality problems addressed in the plan are photochemical oxidants, carbon monoxide and suspended particulates (dust).

TABLE 3

NUMBER OF DAYS SELECTED POLLUTANTS EXCEEDED STATE OR FEDERAL STANDARDS, 1980 AND 1981[1]

Monitoring Site	Ozone[2]		Nitrogen Dioxide		Carbon Monoxide		Suspended Particulates		Sulfur Dioxide	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
San Francisco (Ellis Street)	0.0	0.0	0	0	2	1	6	1	0	0
Redwood City	0.8	1.3	0	0	0	0	1	0	0	0
San Jose	6.2	2.7	1	0	15	5	15	5	0	0
San Rafael	0.7	0.0	0	0	0	0	1	0	0	0
Fremont	5.6	3.7	0	0	0	0	8	0	0	0
Livermore	2.2	2.4	0	0	-	0	9	0	0	0

[1]The State standards are specific concentrations and durations of air pollutants that reflect the relationship between concentration and undesirable effects. They are target values, and no timetable exists for their attainment. The Federal primary standards represent levels of air quality necessary for protection of public health, with an adequate margin of safety. The provisions of the Clean Air Act as amended require that by December 31, 1987 the Federal standards should not be exceeded more than once per year.

[2]In early 1979 the U.S. Environmental Protection Agency adopted a new oxidant standard. The previous standard of 0.08 parts per million for all oxidizing substances was replaced by a standard of 0.12 parts per million for ozone alone, the most prevalent oxidant. The new Federal standard is based on a 3-year average, known as the Expected Annual Exceedance (EAE). An EAE of 1.0 is considered as compliance with the standard.

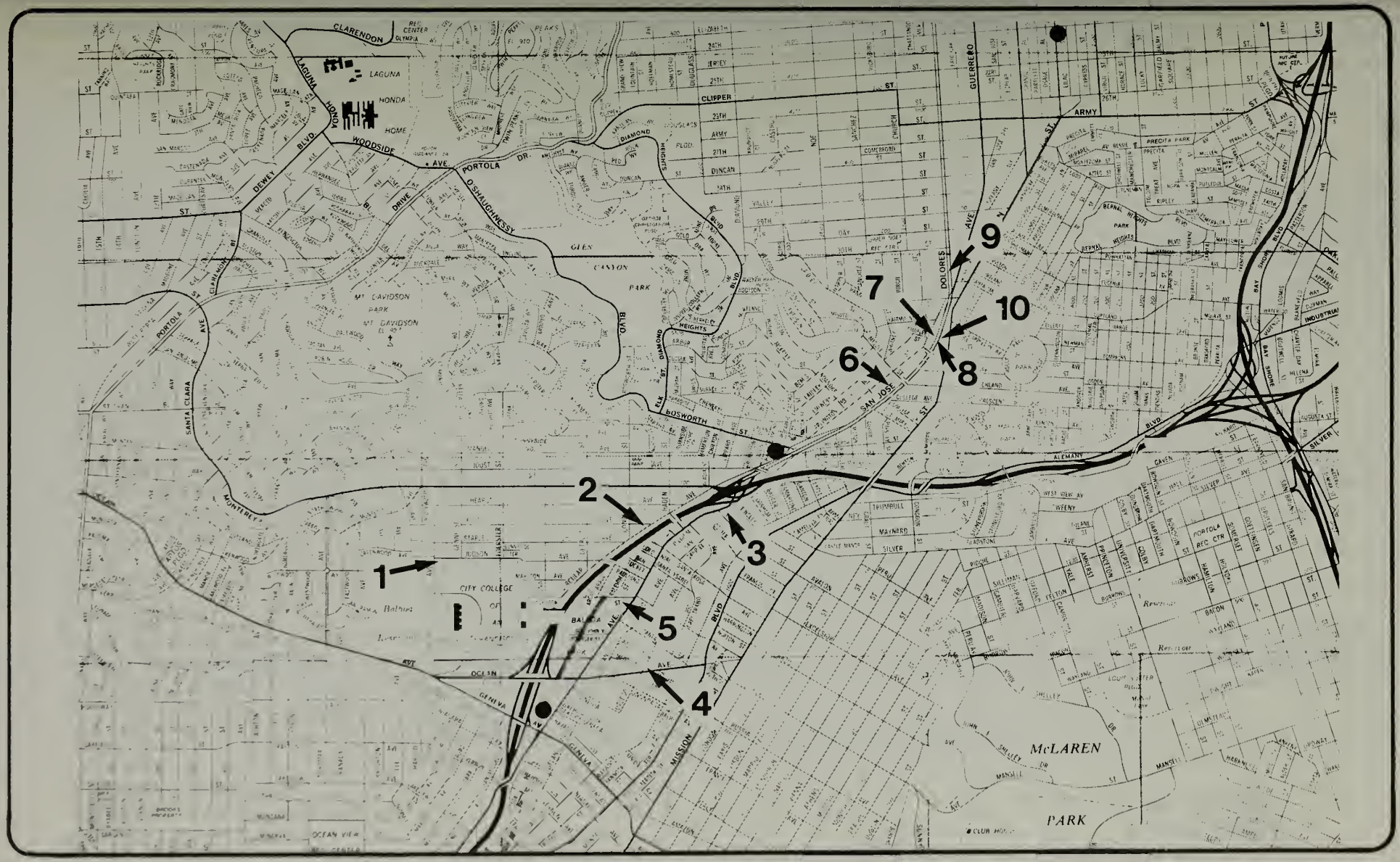
Source: Bay Area Air Quality Management District, Air Currents, Vol. 24, No. 3, March 1981 and Vol. 24, No. 3, March 1982.

2. Noise and Vibration

To quantify the existing noise environment along the alternative routes for the proposed J Line Connection, noise measurements were made at the ten sites shown on Figure 8, page 49. The measurements were made on May 5 and 6, 1981. Because the J Line would be routed on existing streets, the nearest receptors would be buildings along these streets. The row of housing along these streets reduces noise levels a block away by 10 to 15 dBA.[11] (Pesons unfamiliar with the fundamental concepts and terminology of environmental acoustics are referred to Appendix A, page A-1, for further description of these and other terms used in this report). During the visit to the site, the most sensitive receptors in terms of noise and vibration were found to be the residential uses along the alternative routes. Two schools (the City College of San Francisco and the Lick Wilmerding School) are set back from adjacent roads farther than adjacent residences and would be therefore exposed to lower noise and vibration levels.

A continuous 24-hour noise measurement was made at Site No. 7 near the corner of Arlington and Charles Streets overlooking San Jose Avenue. Spot measurements were made at the other sites at various times of day. This method enabled, the calculation of noise levels during other hours at the remaining sites. The results of the noise measurements are summarized in Table 4, page 50. The noise environment throughout the study area is dominated by traffic. Jet aircraft are audible in the study area but in general, their noise is drowned out by traffic noise.

The City and County of San Francisco has adopted the 24-hour average day/night noise level (Ldn) as the metric to be used for describing community noise environments. The Ldn is a single number rating of the community noise environment. It is based on the variation in hourly noise levels throughout the day with 10 decibels added to the hourly noise levels between 10 p.m. and 7 a.m. to account for people's increased sensitivity to noises that occur at night. The Ldn allows a comparison to be made of the noise environments at various locations. Based on the noise measurements, the day/night average noise levels at each of the measurement sites have been calculated and are shown in Table 5, page 52. In the study area the Ldn is within one dBA of the hourly Leq between 7 a.m. and 8 a.m. (the noisiest hour at each site). Therefore the table also shows the Leq[12] at each site during the noisiest hour of the day.



North

0 500 1000 2000

Scale Feet

Noise Measurement Locations

Figure No. 8

TABLE 4

NOISE MEASUREMENT DATA

Site No.	Location	Day and Time of Measurement	L_1*	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}**	Comments
1	Corner of Judson and Phelan 68 feet south of Judson centerline and 93 feet east of Phelan centerline	Tuesday 5/5/81 12:07-1:08 pm	68	63	56	51	47	59	Traffic: buses, motorcycles, automobiles
1	" "	Wednesday 5/6/81 3:59-4:14 pm	72	64	59	54	52	62	"
2	Corner of Circular and Flood 38 feet from centerline of each	Tuesday 5/5/81 12:30-12:45 pm	73	70	67	64	61	68	I-280 traffic is major noise source
2	" "	Wednesday 5/6/81 10:59-11:14 am	73	70	67	64	61	68	"
3	95 feet west of Tingley Avenue and 43 feet south of the center of San Jose Avenue	Tuesday 5/5/81 12:53-1:08 pm	73	68	65	62	61	66	Traffic on San Jose and on I-280
3	" "	Wednesday 5/6/81 1:47-2:02 pm	73	68	65	63	62	66	"
4	Corner of Otsego and Ocean Avenue 22 feet east of center of Otsego and 44 feet north of center of Ocean Ave.	Tuesday 5/5/81 1:32-1:47 pm	78	68	62	54	50	66	Traffic on Ocean Avenue: buses, trucks and automobiles
4	" "	Wednesday 5/6/81 3:17-3:32 pm	74	68	62	55	53	65	"
5	Balboa Park, 40 feet west of center of San Jose Avenue	Tuesday 5/5/81 1:53-2:08 pm	72	69	61	57	55	64	Traffic on San Jose: buses, trucks, motorcycles, automobiles

TABLE 4 (cont.)

NOISE MEASUREMENT DATA

Site No.	Location	Day and Time of Measurement	L_1*	L_{10}	L_{50}	L_{90}	L_{99}	L_{eq}**	Comments
6	Overlooking San Jose Avenue between Mateo and Miguel Streets	Tuesday 5/5/81 2:24-2:39 pm	70	67	64	61	56	65	Traffic on San Jose: buses, trucks, motorcycles, automobiles
6	" "	Wednesday 5/6/81 1:05-1:20 pm	70	69	64	59	54	64	"
8	Overlooking San Jose Avenue approximately 200 feet north of Charles Street bridge	Tuesday 5/5/81 3:10-3:25 pm	72	70	67	62	55	67	"
9	East side of Dolores Street 55 feet from the center of Dolores Street and 185 feet from 30th Street	Tuesday 5/5/81 3:33-3:48 pm	72	67	62	58	55	64	Traffic on Dolores Street
9	" "	Wednesday 5/6/81 4:22-4:37 pm	71	66	62	58	54	63	"
10	In front of #3639 Mission Street, 38 feet from the center of the street	Wednesday 5/6/81 11:32-11:47 am	78	72	67	59	56	70	Traffic on Mission Street

*The sound level in dBA that was equaled or exceeded 1 percent of the time; L_{10}, L_{50}, L_{90} and L_{99} are the levels equaled or exceeded 10, 50, 90, and 99 percent of the time, respectively.

**The L_{eq} is the equivalent steady-state sound level that, in a stated period of time, would contain the same acoustic energy as the time-varying sound level during the same time period.

TABLE 5
DAY/NIGHT NOISE LEVELS

Site	Day/Night Noise Levels Ldn
Site 1	62
Site 2	71
Site 3	69
Site 4	69
Site 5	67
Site 6	68
Site 7	69
Site 8	70
Site 9	67
Site 10	73

It can be seen that with the exception of Site 1, the noise environment throughout the study area is similar. Each site is exposed to noise from a nearby roadway with a significant percentage of trucks, buses and motorcycles. Site 1 (near City College) is exposed to more slower-moving traffic than the other sites and therefore exhibits lower noise levels. For those buildings located along San Jose Avenue, Ocean Avenue, Mission Street and Dolores Street, the noisiest events that occur are generally motorcycles, trucks and buses. Typical maximum[13] levels of individual vehicles ranging from 70 to 80 dBA were measured during the survey.

The measured noise levels correspond with the noise level estimates for the study area contained in the Environmental Protection Element of the Comprehensive Plan of the City and County of San Francisco. This document estimates that noise levels in the study area range from an Ldn of 65 to 70 dBA. Noise levels in this range are described as loud.

3. Vegetation

One proposed alternative may traverse the one block section of Dolores Street between 30th Street and San Jose Avenue. In this section of Dolores Street there are 13 Canary Island Date Palms (Phoenix canariensis).

Near the intersection of San Jose Avenue and Havelock there is a 60-foot Monterey Cypress tree that may require trimming to accommodate the overhead wires.

4. Energy

Energy for the operation of San Francisco Municipal Railway electric vehicles is generated by hydroelectric power by Hetch Hetchy Water and Power Department.

The existing transit service for which energy consumption would be impacted by the proposed project is the number 26 bus line which consumes approximately 10 million BTU in the form of diesel fuel (approximately 68,000 gallons) annually.[14]

5. Geology and Seismicity

a. San Jose Avenue Alignment

The proposed San Jose Avenue Alignment for the J Line Connection is underlain by unconsolidated native soils. From 30th Street to Monterey Boulevard the material is slope debris and ravine fill consisting of stony, silty to sandy clay with pockets of muddy sand or gravel. From Monterey Boulevard to Geneva Avenue the surface material is the Colma Formation, which is composed of easily broken, pulverized, poorly cemented, well-sorted fine to medium sand containing a few beds of sandy silt, clay and gravel. Within the three-fifths of a mile south of 30th Street there are bedrock outcrops of sandstone, chert and greenstone, all belonging to the Franciscan Formation, which have been covered by highway construction along San Jose Avenue. Artificial fill underlies part of the bridge/interchange complex at the junction of San Jose Avenue, Monterey Boulevard and I-280.[15]

The thickness of the unconsolidated material varies from 0 to approximately 100 feet. North of Monterey Boulevard the freeway interchange overlies artificial fill and slope debris to a depth of 75 feet. Farther north, depths of less than 25 feet are common. South of Monterey Boulevard the Colma Formation increases in thickness from approximately 50 feet to approximately 75 feet at the entrance of Balboa Park and to 100 feet on

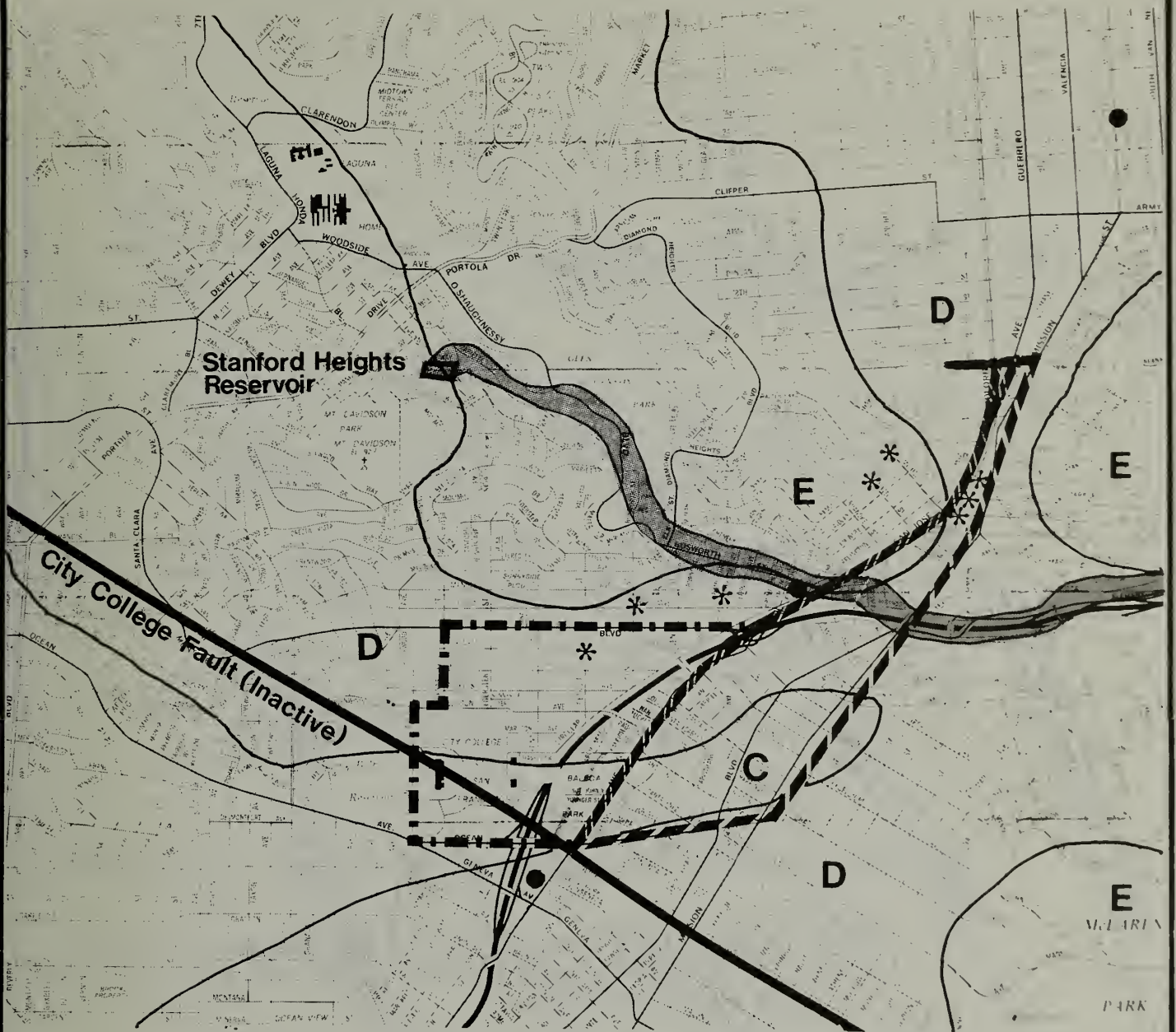
the south side of Ocean Avenue. It then decreases to approximately 75 feet at Geneva Avenue.[16]

Grading of San Jose Avenue has reduced much of the topography along the proposed alignment to long, even slopes generally rising from approximately +140 feet San Francisco Datum (SFD)[17] at Dolores Street to approximately +190 feet SFD at Ocean Avenue. Steeper changes in gradient occur along short portions of the alignment south of30th Street, through the highway interchange and north of Geneva Avenue. Those slopes which have not yet been reduced have experienced some landsliding (Figure 9a, page 55), most notably in the cuts near the intersection of San Jose Avenue and Mission Street.[18] Since the proposed connection alignment would follow existing roadways on grade, no major cuts or fills are planned.

There are four major fault zones in the San Francisco Bay Area, shown in Figure 10, page 57, which are capable of causing ground motion along the proposed project alignment. The San Andreas Fault and the Seal Cove Fault are located off the Pacific shore approximately 8 miles and 13 miles, respectively, from the project alignment. The Hayward Fault and the Calaveras Fault are approximately 12 and 22 miles east of the alignment. Each of these systems is considered active and is capable of generating a major earthquake (greater than magnitude 6.0 on the Richter scale)[19] during the next 50 years.

There is one inactive fault which crosses the proposed project alignment. This is the City College Fault which has shown no evidence of surface movement during the last 2,000,000 years. However, minor earthquake activity (Richter magnitude 0.5 to 1.5) continues to be epicentered in the area of the fault.[20] The site is in a seismically active region which annually experiences low to moderate magnitude earthquakes epicentered along the major fault lines. In 1979 a minor earthquake (Richter magnitude 4.2) occurred along the San Andreas Fault; one minor and one moderate earthquake (Richter magnitudes 4.8 and 5.9) occurred along the Calaveras Fault.[21] Three earthquakes of Richter magnitude 5.5 to 5.9 occurred along the Calaveras Fault in 1980.[22]

Based on records of previous earthquakes, the groundshaking along the proposed alignment during a seismic event the size of the 1906 San Francisco earthquake (Richter magnitude



C,D,E Ground Shaking Intensity

* Landslide

San Jose Avenue Alignment

Monterey Boulevard Alignment

Reservoir Failure Flood Area

City College Fault

Mission Street Alignment

Geologic Impact

North

0 500 1000 2000

Scale Feet

Source: URS/John A. Blume Assoc, 1974

Figure No. 9a

A Very violent. Cracking and shearing of rock masses. Deep and extended fissuring in soil, many large landslides and rockfalls.

B Violent. Fairly general collapse of brick and frame structures when not unusually strong. Serious cracking of better buildings. Lateral displacement of streets, bending of rails and ground fissuring.

C Very strong. Masonry badly cracked with occasional collapse. Frame buildings lurched when on weak underpinning with occasional collapse.

D Strong. General but not universal fall of brick chimneys. Cracks in masonry and brick work.

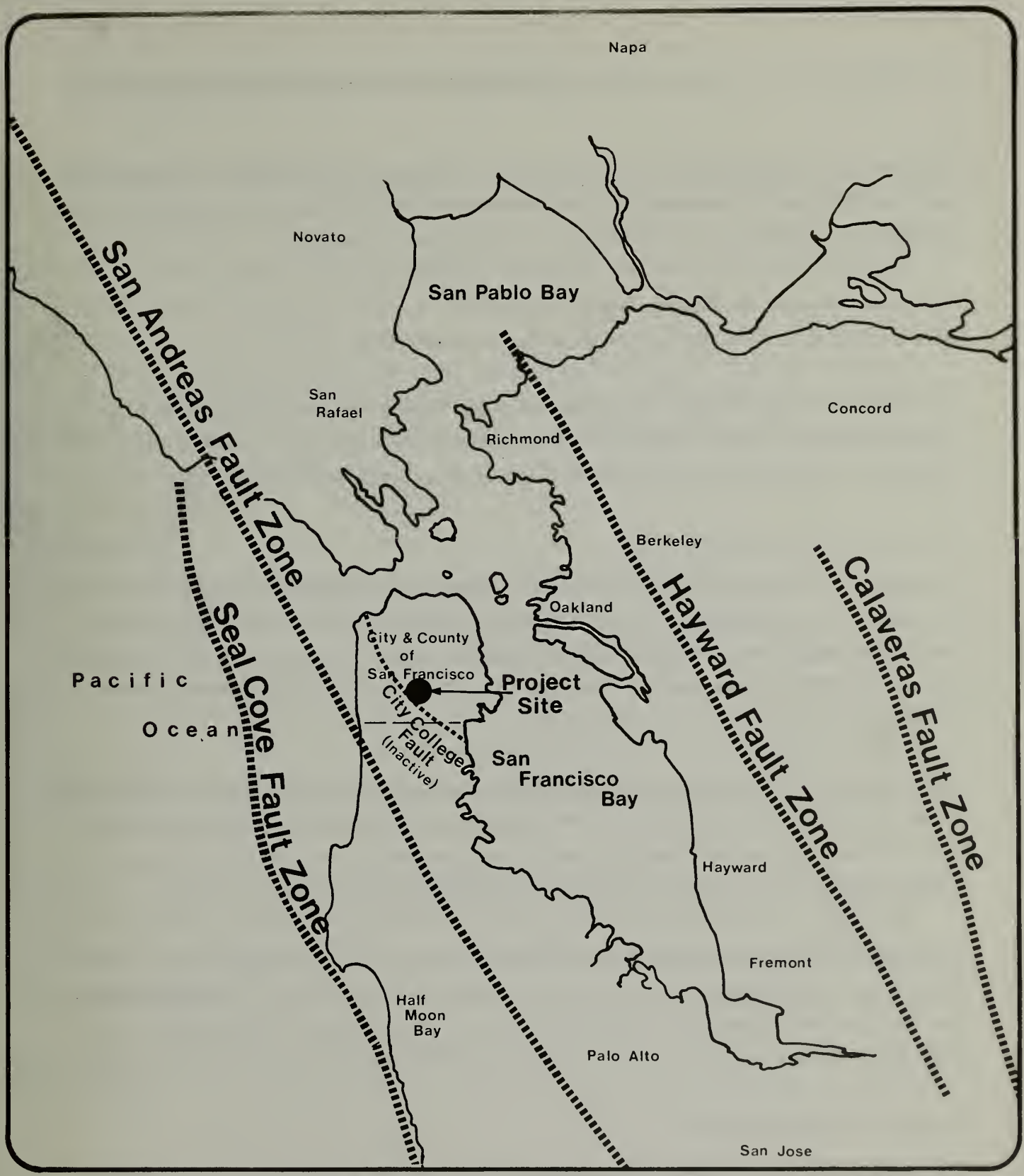
E Weak. Occasional fall of brick chimneys and plaster.

NOTE: Intensities are given for earthquakes similar to the 1906 event in Magnitude and proximity to San Francisco.

Legend:

Estimated Intensity of Future Ground Shaking

Figure No. 9b



Active Fault Zones in the San Francisco Bay Area

North

0 4 8 16

Scale Miles

Source: California Division of Mines and Geology; Fault Map of California, Data Map Series No.1, 1975

Figure No.10

8.3) would vary from "weak" to "very strong." Along most of the route, groundshaking would be "strong."[23] Groundshaking would be "weak" along 0.2 mile of the alignment and "very strong" along 0.1 mile of the alignment (see Figure 9a, page 55).

The possibility of earthquake-induced landsliding is evident from the clustering of previous landslides along the north half of the alignment (Figure 9a).[23]

The Stanford Heights Reservoir, located at Agua Way and Teresita Boulevard, is in an area which also would experience "strong" groundmotion during a great earthquake. The reservoir is a possible source of flooding if failure occurred in an earthquake.

b. Monterey Boulevard Alignment

The Monterey Boulevard Alignment is mostly underlain by the same soils that underlie the San Jose Avenue Alignment.[24] The two main differences in subsurface conditions are that more Franciscan Formation bedrock is exposed along this alignment, particularly in the vicinity of City College of San Francisco, and that soil thicknesses, which vary from 0 to 100 feet, are generally less than along San Jose Avenue.[25]

Road gradients rise and fall more steeply than on either the San Jose Avenue Alignment or the Mission Street Alignment. Surface elevations increase from approximately +140 feet SFD near the Dolores Street/San Jose Avenue intersection to +200 feet SFD near the I-280 interchange and to +370 feet SFD on Monterey Boulevard at Foerster Street.

Seismically, the Monterey Boulevard Alignment is similar to the San Jose Avenue Alignment. Groundshaking would vary from "weak" to "very strong."[26] Approximately 0.4 miles of this alternative alignment is in a "very strong" groundshaking zone (Figure 9a).

c. Mission Street Alignment

The Mission Street Alignment is underlain by the same soils that underlie the San Jose Avenue Alignment.[27] The same subsurface conditions apply, but the thickness of the soil is deeper, 100 to 150 feet, near the intersection of Mission Street and Geneva Avenue.[28]

Road gradients rise and fall more steeply along Mission Street than along the San Jose Avenue Alignment. Surface elevations increase from approximately +140 feet SFD near the Dolores Street/San Jose Avenue intersection to +200 feet SFD near Appleton Avenue. Elevations between Appleton Avenue and Geneva Avenue vary from +90 feet SFD to +230 feet SFD.

Seismically, the Mission Street Alignment is similar to the San Jose Avenue Alignment with the exception that it passes through approximately one mile of a "very strong" groundshaking zone.[26] (The San Jose Avenue Alignment passes through 0.3 mile of a "very strong" groundshaking zone.)

6. Hydrology

Mean annual rainfall in the project area is about 22 inches per year.[29] No surface waters are directly influenced by the proposed construction. The entire San Jose Avenue Alignment is surfaced with either concrete or asphalt and is drained into the City's storm drain system. Stormwater runoff from paved surfaces varies between 70% and 95%.[30]

Urban pollutants, including petrochemical residues released from automobiles, heavy metals from vehicle emissions, organic debris, fine seidments, pesticides and herbicides currently are leaving the alignment with each rainfall or street cleaning.

Hydrologic conditions along the Monterey Boulevard Alignment are similar to those along San Jose Avenue. Although stormwater runoff quantities are about the same, the potential for erosion is greater due to the steepness of slopes along Monterey Boulevard near Genessee Street.[31]

Hydrologic conditions along the Mission Street Alignment are identical to those along San Jose Avenue.

---

[1] U.S. Bureau of the Census, 1980 Census Information, File STF1-A, March 1982, Table 1, and 1970 Census of Population of Housing, Report PHC (1)-189, Table P-1

[2] Joseph Sullivan, Chief, San Francisco Fire Department, Planning and Research Division, telephone conversation, November 24, 1981.

[3]James Farrell, Sergeant, San Francisco Police Department, Crime Analysis Division, telephone conversation, November 24, 1981.

[4]Dean Coffee, General Manager, Hetch Hetchy Water and Power, City of San Francisco, telephone conversation, July 7, 1982.

[5]Metropolitan Transportation Commission, Annual Report: Municipal Railway, San Francisco, April 1, 1981, Form 100.

[6]Jim Smith, Analyst, Finance Bureau of the Public Utilities Commission, telephone conversation, August 24, 1982.

[7]Source: San Francisco Traffic Engineering (Gordon Chester)

[8]Source: San Francisco Traffic Engineering (Mark Rand 7/82). The improvement would be financed by Federal Highway Administration FAU funding.

[9]Source: San Francisco Traffic Engineering (Gordon Chester).

[10]Association of Bay Area Governments, 1979 Bay Area Air Quality Plan, January 1979.

[11]Beranek, Leo L., "Noise and Vibration Control," McGraw-Hill Book Company, 1971.

[12]Leq: The equivalent steady state sound level which in a stated period of time would contain the same acoustic energy as the time varying sound level during the same time period.

[13]As used in this report, the maximum noise level of a vehicle passby is the maximum A-weighted noise level read on a sound level meter set to slow response (see also Appendix A, page A-1 for further description of terms).

[14]Ross Maxwell, Project Engineer, Parsons, Brinckerhoff, Quade and Douglas, telephone conversation, December 2, 1981.

[15]Bonilla, M.G., Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California, U.S. Geologic Survey Misc. Field Study Map MF-311, Washington, DC, 1971, scale 1:24,000.

[16]Bonilla, M.G., Bedrock-Surface Map of the San Francisco South Quadrangle, California, U.S. Geological Survey Preliminary Map, Washington, DC, 1964, scale 1:20,000.

[17]San Francisco Datum is approximately 8.6 feet above mean sea level.

[18]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, Figure 4.

[19]Richter scale: a logarithmic scale developed in 1935 by Charles Richter to measure earthquake magnitude by the energy released, as opposed to earthquake intensity as determined by effects on people, structures and earth materials.

[20]Brown, Jr., R.D. and Lee, W.H.K., Active Faults and Preliminary Earthquake Epicenters (1969-1970) in the Southern Part of the San Francisco Bay Region, U.S. Geological Survey Misc. Field Study Map MF-307, Washington, DC, 1977, scale 1:250,000.

[21]Earthquakes in the United States, 1979, U.S. Geological Survey Circular 836, 1980-81, pages B19, C19, C27.

[22]Preliminary Determination of Epicenters, Monthly Listings, U.S. Geological Survey, 1980-1981.

[23]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, page 14 and Figure 3; page 17 and Figure 4.

[24]Bonilla, M.G., Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California, U.S. Geologic Survey Misc. Field Study Map MF-311, Washington, DC, 1971, scale 1:24,000.

[25]Bonilla, M.G., Bedrock-Surface Map of the San Francisco South Quadrangle, California, U.S. Geological Survey Preliminary Map, Washington, DC, 1964, scale 1:20,000.

[26]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, page 14 and Figure 3; page 17 and Figure 4.

[27]Bonilla, M.G., Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California, U.S. Geologic Survey Misc. Field Study Map MF-311, Washington, DC, 1971, scale 1:24,000.

[28]Bonilla, M.G., Bedrock-Surface Map of the San Francisco South Quadrangle, California, U.S. Geological Survey Preliminary Map, Washington, DC, 1964, scale 1:20,000.

[29]ABAG, Manual of Standards for Erosion and Sediment Control Measures, Berkeley, CA, July, 1981, page 21.

[30]ABAG, Erosion and Sediment Control Training Handbook, Berkeley, CA, July, 1981, page 4.38.

[31]U.S. Department of the Interior, Federal Register, Annual Listing of Historic Properties, Part III, February 1980; Part II, February 1981; Part III, February 1982.

IV. ENVIRONMENTAL CONSEQUENCES/IMPACTS AND MITIGATION MEASURES

A. LAND USE AND URBAN DESIGN

1. Conformance with Existing Land Use

Since the three alternative build alignments would occur within the street rights-of-way, no direct land use impacts would result from implementation of any alignment alternative.

The Mission Street Alignment could possibly affect the southwest corner of 30th and Mission Streets where a Chevron gas station is located. Any potential impact at this location would only be as required to provide an adequate turning radius from 30th Street onto Mission Street.

The alignments would be located in the streets. None of the alternatives being considered would actually divide a neighborhood in a physical sense. The major arterials which the alternatives utilize could in themselves be considered as borders or edges of neighborhoods.

The current availability of vacant land for increased commercial or residential use in the areas served by all the proposed alignments is limited. The San Miguel School, the Old Geneva Car Barn and the adjacent lot, which are potential sites for development along the proposed San Jose Avenue Alignment, are public property and commercial development is not anticipated.

With the increased demand for housing in the Bay Area, there may be future pressure by landowners to rezone certain areas to permit higher density residential land use. Since such affected areas could be those with amenities, such as proximity to transit facilities, the J-Line Connection could result in pressure from landowners in the vicinity of any new transit service to permit increased residential density. However, this did not happen in this area with the institutiobn of BART service in the early 1970s.

The proposed J-M combination double loop would also make the southwest segments of the City including San Francisco State University and the Stonestown Shopping Center more accessible for transit riders. Increased accessibility could potentially increase patronage of shopping districts in the immediate vicinity of the proposed alignments.

It is not anticipated that the improvement of transit connections would induce change in the level of economic activity in any of the neighborhood served by the Muni.

2. Displacement and Relocations

None of the alternative alignments would result in the relocation of houses or businesses or the displacement of people, since each alternative alignment is located within existing street rights-of-way.

3. Visual Effects and Conformance with Urban Design Principles

If no action is taken on the Muni J Line Connection, the aesthetic character of the area would not be altered. Several visual effects would be common to all of the three alternative alignments. One visual effect would be the electrical supply overhead wires and support poles added by the project for power pickup by the streetcars. These wires would be at the same level as second-story, primary living spaces of the residences that occur along the proposed alignments. The proximity of the proposed power sources to the windows of residences would be especially intrusive when electrical arcing occurs as the streetcar pantograph passes over fixed points. The visual effects of this arcing would be intensified at night or on overcast days when, due to the contrast, the sparks are more apparent. At curves and changes of direction in the system there would be a greater number of wires; these plus the additional electrical power equipment and supports would be more intensive and appear more evident.

All of the proposed alignments would have streetcar tracks set into the asphalt paving. Visually these tracks would have little effect on the aesthetic character of any of the alignments, since they would be set into the street.

Additional headlights and the illumination of the interiors of the streetcars would have a visual effect. The cumulative effect of these additional lights and glare would be imperceptible, given the magnitude of the existing traffic and level of street lighting on

all of the alternative alignments. The final visual effect on any of the alignments would be the addition of streetcars traveling the streets that would affect the perceived overall quantity of vehicular traffic flow within the project area at various times of the day (see Section IV.C.1., Transportation, Impacts on traffic, page 82).

With respect to the proposed project's conformance to urban design principles, there are a number of policies contained in the Urban Design Plan of the San Francisco Comprehensive Plan that allow further assessment of the effects common to all three alternative build alignments.

City Pattern Policy #1: "Recognize and protect major views in the City, with particular attention to those of open space and water."

None of the three build alignments would involve a major public vista point. Nor would any of the alignments affect vistas from the surrounding roads and public places.

Neighborhood Environment Policy #1: "Protect residential areas from the noise pollution and physical danger of excessive traffic."

For impacts on traffic levels in the project area resulting from the proposed project, see Section IV.C.1., Transportation, Impacts on Traffic, page 82.

Neighborhood Policy #14: "Remove and obscure distracting and cluttering elements."

As previously stated, each of the alternative alignments would add an overhead electrical supply line with its wires and support poles. The addition of this power system would add visual overhead elements to pedestrians at street level and generally would appear at eye-level to occupants at the second floor of multi-story structures along all of the proposed alignments. The presence of transit vehicles would not be an adverse visual impact.

Environmental Protection Element, Transportation Noise Policy 5: "Retain and expand the electric trolley network."

The three build alignments would comply with this policy which encourages the use of electric transit vehicles.

In addition to the effects common to all three of the alternative alignments, each of the alignments would have certain unique environmental consequences. Due to the location of Balboa Park along San Jose Avenue the overhead power system associated with the proposed streetcar line would alter the uncomplicated visual character of the east edge of the park. The presence of streetcars also could alter the character of the park's east edge because the streetcars and overhead wiring would be a new element introduced to the setting. The streetcars, however, would provide improved access to the recreational facilities of the park. The sunken portion of San Jose Avenue would offer the opportunity to place the needed overhead electrical supply line for the power system without impacting nearby residences where living quarters are 30 to 50 feet above the street level. However, the pedestrian connection proposed from this sunken portion to the Glen Park BART station would require a 40-foot staircase from the center median, which would be unsuitable for access for the elderly and the handicapped (see Section IV.C.3., Transportation, Pedestrian Impacts, page 107).

The proposed Monterey Boulevard Alignment would require additional overhead power lines on the existing Gennessee Street overhead utility lines. This alignment also would require the addition of power supports to the landscaped center median along Monterey Boulevard. This alignment would provide easy pedestrian access to the Glen Park BART station from Circular Avenue along Diamond Street.

The proposed Mission Street Alignment would follow the existing electric bus (trolley) route. An additional overhead power line would be added for the proposed streetcar. However, the Mission Street Alignment is lined predominantly with commercial uses; the visual impacts of these lines on residences would be less than either of the other alignments.

Mitigation

To reduce the number of vertical support standards for the overhead electrical power lines, existing street lamp and overhead utility standards will be used as much as possible, or affixed to building facades where structurally possible, if the project is built.

4. Compliance with Existing Plans and Policies

The proposed project would meet the objectives and policies of the Transportation Element of the Comprehensive Plan. In particular the project would meet both objectives

of the Mass Transit Plan: (1) "Give first priority to improving transit service throughout the City, providing a convenient and efficient system as a feasible alternative to automobile use," and (2) "Develop transit as the primary mode of travel to and from downtown and all major activity centers." The project would reduce dependence on the private automobile commuters in San Francisco by providing crosstown service to City College, San Francisco State University and Stonestown Shopping Center.

Objective 4 of the Thoroughfares Plan to the Transportation Element of the Comprehensive Plan "allow(s) for the safe use of the bicycle as a means of transportation and recreation." A portion of San Jose Avenue is a bicycle route. A portion of the bicycle route may be displaced if the San Jose Avenue Alignment were built.

The Citywide Recreation and Open Space Plan recognizes Balboa Park as Public Recreation and Open Space. Policy 3 calls for the encouragement of the use of public transit for recreation travel. The project alternatives would provide streetcar access to this recreational facility.

B. SOCIO-ECONOMIC IMPACTS

1. Economic and Fiscal Impacts

The fiscal impacts of the three project alternatives are calculated in terms of net savings or costs over the no-project alternative. In addition to the three alternative routes over which the J Line Connection may be constructed, options exist as to how revenue passenger service may be run over these routes. The J Line may be through-routed to the M line to form a loop, as proposed in the Muni 1980-1985 5-year Plan (see Section IV C.2., page 94). Also, 12-minute headways may be instituted south of 30th Street. The fiscal analysis considers this subalternative for each of the the project alternatives.

a. Operating Revenues and Costs

San Jose Avenue Alignment. The estimated change in San Francisco Muni's total patronage due to the J Line Connection via the San Jose Avenue Alignment would be 1,200 to 1,500 additional daily riders if the J Line Connection terminates at the Metro Center and and 2,500 to 3,000 additional riders if the J and M lines were combined. These would be new trips on Muni. The actual patronage on the J Line Connection would be a

combination of these new trips and diversion from the No. 26 bus route (see Section IV.C.2., page 94). These added riders primarily would not be downtown-oriented and so it is not expected that additional J line vehicles would be required at its Duboce Portal maximum load point. Much of the increased ridership would be in the reverse peak direction towards San Francisco State and Stonestown. The patronage estimate assumed that downtown commuters would continue to use BART where possible.

The San Jose Avenue Alternative provides the potential for operational cost savings, by shortening the J-Church and N-Judah Muni Metro routes. For the J line, the savings in time would be an estimated 1,030 minutes per weekday. For the N line the time savings would be an estimated 850 minutes per weekday. With the J and N combined, the savings would be 9,250 vehicle hours per year (based on a seven-day operating schedule). With 12-minute headways, 500 minutes would be saved per weekday or 2,166 hours per year on the J line.

Table 6, page 68 gives the operating cost/revenue picture for the San Jose Avenue alternative in fiscal year 1980-81 dollars. The financial benefits include the decreases in operating costs related to time and travel savings and in truncating the No. 26 route, plus the added revenue from the net additional patronage. However, additional operating costs would be associated with revenue passenger service on the J Line Connection. The calculations of cost savings and additional operating costs are based on current figures of $43 per hour for LRVs and $27 per hour for diesel buses.[1] For the San Jose Avenue Alternative the net benefit for the San Francisco Muni operating budget is estimated at $180,000 - $230,000 per year (1980-81 dollars). The net operating benefit if the J line is not through-routed with the M line is estimated at $40,000-$70,000 per year (1980-81 dollars). If 12-minute headways are scheduled south of 30th Street during midday runs, the net operating savings would range from $270,000 to $320,000.

Monterey Boulevard Alignment. The estimated change in overall San Francisco Muni patronage due to the J Line Connection via the Monterey/Phelan route would be 1,500-1,800 additional daily riders if the J Line Connection terminates at the Metro Center (and 2,000-2,500 riders if the J and M lines were combined. These would be new trips on Muni. The actual patronage on the J Line Connection would be a combination of these new trips and diversion from the No. 26 bus route. These added riders would primarily not be downtown-oriented and so it is not expected that additional J line vehicles would be

TABLE 6

ESTIMATED INCREMENTAL OPERATING COSTS AND REVENUES
(Seven Day Operating Schedule)

SAN JOSE ALTERNATIVE

Item	Annual Cost or Revenue (1980-81 Dollars)	
Vehicle Operating Costs (includes vehicle maintenance costs)		
J Line		
Operating Savings for Existing Scheduled Vehicles	$ 220,000	
Additional Cost for Service of Longer Line[1]	(550,000)	[2]
N Line		
Operating Savings for Existing Schedule Vehicles	180,000	
26-Valencia		
Savings for Short Route[3]	240,000	
NET OPERATING COST REDUCTION	$ 90,000	
Track and Overhead Maintenance Costs[4]	(180,000)	
Passenger Revenue Increase[5]	270,000-320,000	
Net Annual Savings	$ 180,000-230,000	[6,7]

[1] Assumes 6-minute headways and peak and midday.

[2] With 12-minute headways south 30th Street, 10:00 a.m. to 3:00 p.m. weekdays, then operating cost of J Line Connection is $460,000.

[3] Five-Year Plan routing fro 26-Valencia.

[4] Average of Muni, Portland, San Jose, estimate, April 1980, $40,000 per mile of track.

[5] If J line not combined with M line, estimated net revenue increase $130,000-160,000.

[6] With the savings in operating costs associated with 12 minute headways, net annual savings would be $270,000 - $320,000.

[7] With the added operating costs incurred if the J and M lines are not combined, net annual savings would be $40,000 - $70,000.

required at its Duboce-Portal maximum load point. Much of the increased ridership would be in the reverse commute direction towards City College and S.F. State.

The Monterey Boulevard Alignment alternative provides the potential for operational cost savings by shortening the routes for the J-Church and N-Judah Muni Metro routes. For the J line, the savings in time would be an estimated 915 minutes per weekday. For the N line, the time savings would be about 600 minutes per weekday. With the J and N combined, the total savings would be 7,730 vehicle hours per year of weekday operation (based on a seven-day operating schedule). With 12-minute headways, 500 minutes would be saved per weekday, or 2,166 hours per year on the J line.

Table 7, page 70, gives the operating cost/revenue picture for the Monterey Boulevard alignment in fiscal year 1980-81 dollars. The financial benefits include the decreases in operating costs related to the time and travel savings, and in truncating the No. 26 route, plus the added revenue from the net additional patronage. Additional operating costs are associated with revenue passenger service on the J Line Connection. The calculations of cost savings and additional operating costs are based on current figures of $43 per hour for LRVs and $27 per hour for diesel buses. For the Monterey Boulevard Alignment alternative the net added cost for the San Francisco Muni operating budget is estimated to be $330,000-$390,000 per year (1980-81 dollars). The net operating cost if the J and M lines are not combined is estimated at $380,000-470,000 per year. If 12-minute headways are scheduled south of 30th Street during midday runs, the net operating cost would range from $180,000 to $240,000.

Mission Street Alignment. The estimated change in San Francisco Muni's total patronage due to the J Line Connection via the Mission Street alignment would be 2,000-2,500 additional daily if the J Line Connection terminates at the Metro Center and 2,000-3,000 additional riders if the J and M lines were combined. These are new Muni trips. The actual patronage of the J Line Connection would be a combination of these new trips and diversion from the No. 26 bus route. These added riders would primarily not be downtown-oriented and so it is not expected that additional J line vehicles would be required at its Duboce-Portal maximum load point. Much of the increased ridership would be the reverse peak direction.

TABLE 7

ESTIMATED INCREMENTAL OPERATING COSTS AND REVENUES
(Seven Day Operating Schedule)

MONTEREY ALTERNATIVE

Item	Annual Cost or Revenue (1980-81 Dollars)
Vehicle Operating Costs (includes vehicle maintenance costs)	
J Line	
Operating Savings for Existing Scheduled Vehicles	$ 200,000
Additional Cost for Service of Longer Line[1]	(920,000) [2]
N Line	
Operating Savings for Existing Schedule Vehicles	140,000
26-Valencia	
Savings for Short Route[3]	240,000
NET OPERATING COST REDUCTION	$ (340,000)
Track and Overhead Maintenance Costs[4]	(260,000)
Passenger Revenue Increase[5]	210,000-270,000
Net Annual Savings	$(330,000-390,000) [6,7]

[1] Assumes 6-minute headways and peak and midday.

[2] With 12-minute headways south 30th Street, 10:00 a.m. to 3:00 p.m. weekdays, operating cost of J Line Connection is $770,000.

[3] Five-Year Plan routing fro 26-Valencia.

[4] Average of Muni, Portland, San Jose, estimate, April 1980, $40,000 per mile of track.

[5] If J line not combined with M line, estimated net revenue increase $160,000-190,000

[6] With the savings in operating costs associated with 12 minute headways, net annual savings would be $180,000 to $240,000.

[7] With the added operating costs incurred if the J and M lines are not combined, net annual savings would be $380,000 to $470,000.

The Mission Street alternative provides the potential for operational savings by shortening the J-Church and N-Judah Muni-Metro routes. For the J line, the savings would constitute an estimated 840 minutes per week day. For the N line the time savings would be 530 minutes per weekday. With the J and N combined, the total savings would be 6,700 vehicle hours per year of weekday operation (based on seven-day operating schedule). With 12-minute headways, 500 minutes would be saved per weekday, or 2,166 hours per year on the J line.

Table 8, page 72, gives the operating cost/revenue picture for the Mission Street alternative in fiscal year 1980-81 dollars. The financial benefits include the decreases in operating costs related to savings, and in truncating the No. 26 route, plus the added revenue from the net additional patronage. Also, additional operating costs would be associated with revenue passenger service on the J Line Connection. The calculations of cost savings and additional operating costs are based on current figures of $43 per hour for LRVs and $27 per hour for diesel buses. For the San Jose Avenue alternative, the net added cost for the San Francisco Muni operating budget is estimated at $450,000-$560,000 per year (1980-81 dollars). The net operating cost if the J and M lines are not combined, is estimated to be $450,000-$610,000 per year. If 12-minute headways are scheduled south of 30th Street during midday runs, the net operating cost would range from $270,000 to $380,000.

b. Capital Costs

Capital costs include the costs of construction and the cost of purchasing additional Muni Metro vehicles to service the J Line Connection. Estimates of construction costs for the three project alternatives have been made by the engineering firm, Parsons, Brinckerhoff, Quade & Douglas and are presented in Table 9, page 73. The values used in the calculation of construction costs are conservative but do not include a number of items such as traffic relocation during construction, fencing, signing, and so on. For this reason, using professional judgment a contingency item of about 20% has been added to each estimate to account for these additional costs.

Muni's current operating experience is that 20% of the LRV fleet is out of service due to maintenance. The capital cost estimate assumes a 20% spare vehicle factor.

TABLE 8

ESTIMATED INCREMENTAL OPERATING COSTS AND REVENUES
(Seven Day Operating Schedule)

MISSION ALTERNATIVE

Item	Annual Cost or Revenue (1980-81 Dollars)
Vehicle Operating Costs (includes vehicle maintenance costs)	
J Line	
Operating Savings for Existing Scheduled Vehicles	$ 180,000
Additional Cost for Service of Longer Line[1]	(1,100,000)[2]
N Line	
Operating Savings for Existing Schedule Vehicles	110,000
26-Valencia	
Savings for Short Route[3]	240,000
NET OPERATING COST REDUCTION	$ (570,000)
Track and Overhead Maintenance Costs[4]	(200,000)
Passenger Revenue Increase[5]	210,000-320,000
Net Annual Savings	$(450,000-560,000)[6,7]

[1] Assumes 6-minute headways and peak and midday.

[2] With 12-minute headways south 30th Street, 10:00 a.m. to 3:00 p.m. weekdays, operating cost of J Line Connection is $920,000.

[3] Five-Year Plan routing fro 26-Valencia.

[4] Average of Muni, Portland, San Jose, estimate, April 1980, $40,000 per mile of track.

[5] If J line not combined with M line, estimated net revenue increase $210,000 to $270,000.

[6] With the savings in operating costs associated with 12 minute headways, net annual savings would be $270,000 to $380,000.

[7] With the added operating costs incurred if the J and M lines are not combined, net annual savings would be $450,000 to $610,000.

TABLE 9

ESTIMATED CONSTRUCTION COSTS[1]

ITEM	ALIGNMENT		
	SAN JOSE	MONTEREY	MISSION
Embedded Track	$ 2,640,000	$ 3,855,000	$ 4,330,000
At-Grade Track	958,000	692,000	--------
Span Wire	635,000	466,000	1,143,000
Double Arm Wire	361,000	729,000	--------
Stations	153,000	255,000	234,000
Structures			
Pedestrian Bridge at Glen Park	263,000	--------	--------
Bridge to Monterey Boulevard[2]	--------	3,113,000	--------
I-280 Bridge Reconstruction	--------	--------	1,564,000
Retaining Walls	253,000	253,000	--------
Underground Feeder	3,043,000	3,850,000	3,264,000
Special Track Work	190,000	270,000	170,000
Utilities	560,000	990,000	1,200,000
SUB TOTAL	$ 9,056,000	$14,471,000	$11,905,000
20% Contingency[3]	1,844,000	2,929,000	2,395,000
TOTAL[1]	$10,900,000	$17,400,000	$14,300,000

[1] Mid 1981 prices - does not include allowances for engineering and administrator or for cost escalation.

[2] Assumed that new bridge would be needed. Traffic problems with using existing bridges (ramps) could lead to hazardous conditions.

[3] Adjusted so total is rounded to nearest $100,000.

Source: Parson, Brinckerhoff, Quade and Douglas, Inc.

San Jose Avenue Alignment. Estimated construction capital costs include a contingency, primarily for the San Jose Avenue segment from 30th Street to Tingley Street, where the work would require street restoration to San Jose Avenue and the traffic problems involved with this high-volume street. Also, the I-280 undercrossing may require extra work. Total construction capital costs are estimated to be $10,900,000.

If six-minute headways were maintained the entire length of the J line, an additional four vehicles would be needed (plus a spare vehicle), assuming the J line ran around Metro Center loop. If every other J car served south of 30th Street, then with 12-minute headways two additional vehicles would be needed (plus a spare). With the J and M lines combined and six-minute headways, three additional vehicles would be needed (plus a spare). Vehicles costs $1,000,000 each.

Monterey Boulevard Alignment. Construction capital cost estimates for this alternative are similar to the San Jose Avenue Alternative due to a segment of common route. A contingency is added to the total primarily for the segment from 30th Street to Monterey Boulevard where the work will require street restoration for San Jose Avenue. The southerly segment appears to be fairly straightforward track in pavement construction. Total costs are thus estimated to be $17,400,000.

If six-minute headways were maintained the entire length of the J line, an additional six vehicles would be needed (plus a spare). However, if only every other J car served south of 30th Street, then with 12-minute headways, an additional three vehicles would be needed (plus a spare). If the J and M lines are combined and with six-minute headways, four additional vehicles would be needed (plus a spare).

Mission Street Alignment. This route appears to be fairly straightforward track in pavement construction and the total construction capital cost is estimated to be $14,300,000.

If six-minute headways were maintained the entire length of the J line, an additional six vehicles would be needed (plus a spare). If, however, only every other J car serves south of 30th Street, then with 12-minute headways an additional three vehicles would be needed (plus a spare). If the J and M lines were combined, and with six-minute headways, four additional vehicles would be needed (plus a spare).

c. Fiscal analysis

The previous discussion has outlined estimated capital costs and operating savings or costs over the No-build Project Alternative. In calculating the fiscal impacts on Muni only a portion of these expenses are included. Specifically, it is assumed that UMTA will fund 80% of the capital cost of the project. It is possible that this level of federal assistance would not be available and that Muni would have to assume a larger proportion of the capital costs. In order to calculate life-cycle costs of the project, it was assumed that Muni would have to fund 100% of operating expenses from operating revenues. This is a very conservative assumption since Muni currently funds less than 40% of its budget with its own revenues. Finally, operating savings and costs are extended uniformly over a 30-year life for the project and discounted to present value (1981 dollars) at a four percent per year rate.[2]

The results of the fiscal analysis are presented in Table 10, page 76. The sub-alternative returning the greatest net savings at $2,200,000 to $3,090,000 is the San Jose Avenue Alignment with 12-minute headways south of 30th Street. The Mission Street and Monterey Boulevard Alignment alternatives return net costs over the life of the project.

It should be noted that the level of federal assistance is critical for this analysis. The San Jose Alignment alternative returns the highest operating savings, but would require a minimum federal assistance for 60% of the capital costs in order to return net savings.

2. Public Services and Utilities

a. Fire[3]

No impacts on fire protection services would be generated by implementation of the No-Build Alternative. The fire department must be able to maintain access to buildings on either side of the selected alignment construction zone. Common to the three alignment alternatives is the potential for more reserve calls pertaining to injuries involving Municipal Railway vehicles, primarily because LRV riders would be embarking and disembarking the LRV from the street rather than from the sidewalk.

The project could affect response time along narrow streets within any of the alignments due to the fact that LRV movement would be limited by fixed guideways, and the LRV could be unable to allow full access to emergency vehicles.

TABLE 10

FISCAL IMPACTS OF J-LINE CONNECTION ON SAN FRANCISCO MUNICIPAL RAILWAY
(Constant 1981 Dollars in 1000s of Dollars)

Alignment Alternative		Capital Costs[1]	Present Value Operating Savings (Costs)	Net Savings (Costs)[2]
1a.	San Jose Ave.	3,140	2,240-4,320	(900)-1,180
1b.	J-M Not Combined	2,900	720-1,260	(1,640-2,180)
1c.	12-Minute Headways	2,660	4,860-5,750	2,200-3,090
2a.	Monterey Blvd.	4,920	(5,930-7,010)	(10,850-11,930)
2b.	J-M Not Combined	4,440	(6,830-8,450)	(11,270-12,890)
1c.	12-Minute Headways	4,200	(3,240-4,320)	(7,440-8,520)
3a.	Mission Street	4,300	(8,090-10,070)	(12,390-14,370)
3b.	J-M Not Combined	3,820	(8,090-10,970)	(11,910-14,790)
1c.	12-Minute Headways	3,580	(4,850-6,830)	(8,430-10,410)

[1] 20% of total cost of construction and rolling stock.

[2] Present value operating savings (costs) minus capital costs.

Sources: Parson, Brinckerhoff, Quade and Douglas
EIP Corporation

b. Police

Construction activity along Mission Street may hinder police response time to emergency calls to stores on Mission Street.[4] Implementation of the No-Build Alternative would not change police services along San Jose Avenue, Mission Street and Monterey or Ocean Avenues.

c. Parks or Other Recreational Facilities

None of the alternatives would affect parks or recreational facilities. The three alignments would pass Dolores Street; the median on Dolores, although not used recreationally, is dedicated City parkland.[5] The Mission Street and Monterey Boulevard Alignments would terminate at the Muni Metro Center opposite Balboa Park. The last segment of the San Jose Avenue Alignment would pass Balboa Park parallel to its eastern boundary. Increased public access to Balboa Park, its swimming pool and other facilities, via the connection alignments (particularly the San Jose Avenue Alignment) would be a beneficial aspect of the project. Policy 3 of the Recreation and Open Space Element calls for the encouragement of the use of public transit for recreational travel.

d. Schools

The proposed Muni J Line Connection would not change demographic patterns in the City and would not, therefore, affect the population of students attending San Francisco public and private schools. The LRV connection from 30th and Church Streets to Muni Metro Center may make traveling to and from school more convenient for students who use public transit.

e. Power and Natural Gas[6,7]

Most streets in the project area are underlain by gas mains and electric lines. Impacts on these facilities would occur where the lines cross under the streets or are not buried below the proposed depth of trenching required for laying the track (two and a half to three feet below street grade). Power lines are also strung above ground. Some of these poles would need to be raised, as the minimum overhead clearance above the LVR's is five feet. Relocation costs would be borne by Muni.

New overhead trolley wire to accommodate the J Line Connection, including provisions for crossing existing trolley bus lines and for a new underground feeder system to provide power to the J line, including changes to two power substations would be required.

There would be sufficient capacity to serve the J Line Connection from existing substations. New feeders would be necessary, and a new overhead system would be required along the selected alignment. Rail line crossings and trolley coach crossings would be located to accommodate pole operation in joint use areas.

No-Build Alternative: No modifications to existing PG&E facilities or City street lights would be necessary.

San Jose Avenue Alignment

A major portion of the San Jose Avenue Alignment is in an underground utility district (Bernal Cut); variance to the district would normaly be required from the Department of City Planning to allow for overhead utility lines. However, overhead utility lines for transit vehicles are exempt from this by Article 18 of the Public Works Code. Few utilities are located in the Bernal Cut.

Within the limits of this alternative there are numerous service lines and drops servicing individual buildings. These would require relocation in the case of the gas lines and raising in the case of overhead facilities.

Monterey Boulevard Alignment

The northern portion of this alternative would be the same as the San Jose Avenue Alignment and therefore the impact on PG&E facilities would be the same. The segment from Circular Avenue along Monterey Boulevard to Gennessee Street has only underground electric cables located on the north side of Monterey Boulevard. Primary feeders cross twice on each block of Monterey Boulevard.

There are two overhead crossings on Baden and Gennessee Streets. The overhead electric lines on Gennessee Street extend on the east side of Gennessee Street and crosses at Staples and Flood Avenues. These would probably have to be raised to meet overhead clearance requirements. At Judson Avenue and Gennessee Street, these lines go underground. Electric lines under Judson and Phelan Avenue are not in the middle of the street and would not be affected by the alternatives.

Gas mains extend down Monterey Boulevard near the center median. Trolley line poles would be placed within this median and may require the relocation of the gas mains which could be from three to five feet below the surface. Feeder lines extend from the six-inch

main in Monterey Boulevard and in Gennessee Street to serve individual buildings. These feeder lines conflict with this alignment and may require relocation. Buried electric and gas lines and overhead electric lines on Ocean Avenue would not be impacted by the Monterey Boulevard Alignment as the connection would use existing K line track.

Mission Street Alignment

Gas mains generally extend down both sides of Mission Street with major crossings at intersections. Both overhead and underground utility lines run concurrently along some segments of the Mission Street Alignment. Areas where networks of electric lines cross alignment routes are located near Mission and Trumbull Streets and Mission and Harrington Streets. Underground gas and electric lines less than about three feet from the surface conflicting with the alignment would have to be lowered or relocated. Some overhead electric lines along the alignment would have to be raised to meet overhead clearance regulations.

f. Communications

Pacific Telephone

Pacific Telephone and Telegraph aerial cables and underground conduits would require relocation wherever these facilities are in conflict with the LRV alignment for any of the alignment.[8] The facilities discussed below may not require relocation to accommodate the proposed J Line Connection. Should relocation be necessary, costs would by borne by Muni.

San Jose Avenue Alignment. Facilities which may be in conflict with this alignment are underground and aerial cables on San Jose Avenue near Roanoke and Mateo Streets which need to be relocated. A conduit lies beneath San Jose Avenue near the center of the street between the intersection of Havelock Street and Ocean Avenue; in addition, two manholes are near the middle of San Jose Avenue at Havelock Street. Conduit crosses San Jose Avenue at Santa Rosa Avenue and Havelock Street/San Juan Avenue. There is also a major conduit crossing and two manholes at San Jose and Ocean Avenues.

Monterey Boulevard Alignment. A buried conduit crosses Monterey Boulevard at Circular Avenue, extending down both sides of Monterey Boulevard. An aerial telephone cable crosses Monterey Boulevard at Edna Street. Aerial cables are on both sides of Gennessee

Street with an overhead crossing at Flood Avenue. Telephone facilities are underground on Phelan and Ocean Avenues, and cross the proposed alignment to serve City College and the BART station. These cables and conduits would need to be relocated.

Mission Street Alignment. Several conduits lie just north of the center of Mission Street. Telephone conduits cross Mission Street at Appleton Avenue, Highland Avenue, Leese Street, Richland Avenue, Crescent Avenue Ney Street, Trumbull Street, Silver Avenue, Santa Rosa Avenue, Excelsior Avenue, Cotter Street, and Francis Street. There is a major crossing of lines at the intersection of Murray/Bosworth Streets and San Jose Avenue. Conduit crosses Ocean Avenue at Harrington Street and Brazil Avenue.

Manholes near the middle of Mission Street and Ocean Avenue which could be in conflict with the Mission Street alignment are located on Mission near the intersection of Bosworth Street and Ocean Avenue. In addition, a concrete viaduct crosses Mission Street between Culvier and Bosworth. The manholes and the viaduct may require relocation. It does not appear that aerial cables would be affected by this route.

Viacom Cablevision[9]

Viacom Cablevision underground and aerial cables would require relocation wherever these facilities were in conflict with the LRV alignment. Relocation costs would be borne by Muni. Temporary disruption of service would occur during facility relocation. Viacom has existing buried conduit crossings on Mission Street at Avalon. By August 1982, Viacom plans to begin construction of underground facilities on Mission Street. The proposed Mission Street Alignment would conflict with cable crossings. Also in 1982, Viacom plans to rebuild and expand underground facilities on Monterey Boulevard. Ninety percent of the facilities here are underground. There is also an existing underground feed to City College at Gennessee and Judson Streets. Within the San Jose alignment there is an underground crossing at Havelock Street near Balboa Park. Existing utility poles on the east side of San Jose Avenue carry a majority of the cablevision lines and are planned to carry new cablevision facilities within the next year.

Due to existing and proposed cablevision equipment and relocation costs, Viacom prefers the San Jose alignment.

g. Water[10]

Common to All Three Alternatives

A ten-inch main extends down 30th Street crossing several lines which include transmission lines on Dolores Street, San Jose Avenue and Mission Street. A concentration of lines exists near the intersection of Dolores and San Jose. A 16-inch line traverses Mission Street at Santa Marina and Randall Streets and Cortland Avenue.

San Jose Avenue Alignment

A 12-inch and a 30-inch transmission line cross San Jose Avenue at Fairmont Street. An 8-inch and a 44-inch main cross San Jose Avenue near Wilder Street. Major crossings occur at Santa Rosa/San Jose Avenues, San Juan/San Jose Avenues and Ocean/San Jose Avenue.

Five additional crossings occur between Capistrano and Ocean Avenues. The eight-inch main beneath San Jose Avenue from Sgt. Younger Street to Ocean Avenue may be located near the center of the Street.

Monterey Boulevard Alignment

A 12-inch and a 30-inch water main cross San Jose Avenue at Fairmount. At Circular Avenue the proposed alignment would cross several mains. Monterey Boulevard contains an eight-inch main on the south side of the block. Six lanes cross Monterey Boulevard from Circular Avenue to Monterey Boulevard. Water lines cross Gennessee at each intersection. Water mains extend near the middle of Judson and Phelan Avenue and could be in conflict with this alignment. A network of mains exists at the intersection of Phelan, Ocean, Harold and Geneva Avenues. This alignment would use existing K line tracks for the remainder of the alignment and would not affect water mains beneath Ocean Avenue from Geneva Avenue to San Jose Avenue.

Mission Street Alignment

A 12-inch main extends beneath the west side of Mission Street from Appleton Avenue to Bosworth and a two and a four-inch line lie beneath the east side of Mission from Crescent to south of Bosworth. These lines would not be affected; however, five mains cross Mission in this area. The 12-inch main contours from Trumbull to Ocean Avenue

with feeder mains connecting to it at each intersection. An eight to six-inch main runs beneath the north side of Ocean. There is a major network of mains at Ocean and San Jose Avenues.

h. Sewer/Storm Water Drainage

Side sewers and major sewers lines are generally buried at least eight feet below the surface; thus, construction and operation of any of the alignments would not affect sewer lines.[11] However, manholes located along the proposed alignments would require relocation, the cost of which would be paid by Muni. Field checks would be required to determine the locations of manholes.

C. TRANSPORTATION IMPACTS

1. Impacts on Traffic

a. Impacts Common to All Build Alternatives

With six-minute headways the J Line Connection would be expected to have minimal impact on traffic flow on streets where it would share the right-of-way with the regular traffic. The principal impacts would be at car stops and areas where special traffic signals are required for LRV turning movements.

Car Stops. For all the build alternatives, with the exception of the section within the Bernal Cut, the Muni Metro car would share a traffic lane with other traffic. To avoid the side friction or conflicts with parked vehicles including double-parked, badly parked or oversized parked vehicles, the LRVs would run in the center lanes. For the safety of patrons boarding or leaving LRVs, therefore, for those street sections with high traffic volumes and with four or more traffic lanes, it is envisioned that low-level station platforms would be built at stop locations. The heavy traffic sections are: San Jose Avenue north of I-280, Mission Street, Monterey Boulevard, Phelan Avenue, and Ocean Avenue east of San Jose Avenue.

The difficulty with a mid-street car-stop platform is that most street sections lack adequate width to accommodate such a platform in addition to moving traffic and parking lanes. Thus, unlike buses, which can pull out of the traffic lanes at stops, the LRV would typically block one moving lane when loading or unloading. In street sections where the

J line would replace the local bus station, such as San Jose Avenue south of Baden Street, the loss of parking spaces due to the station platform may be partially balanced by parking spaces gained by eliminating the bus stop. Even if the LRV stops at an existing bus stop the two-car LRT platform is typically double the length of most bus stops and so may require more parking spaces.

For streets where a bus route and Muni Metro would both operate, such as at 30th Street, Mission Street, Ocean Avenue, Monterey Boulevard and Phelan Avenue, the options are:

- Have the buses use the car-stop platform. Transit patrons waiting for either the bus or the LRV could wait at one spot and not have to run back and forth depending on which comes first. This would improve the effective headway and pedestrian safety as well as simplify transfers between lines. Since both buses and LRVs could stop at the island, the middle lane of traffic would be blocked more often. Buses and LRVs operating in the same lane would potentially interfere with each other.

- Have the bus and car-stop platforms side by side. This would reduce the number of parking places taken and simplify transferring between lines. However, if a bus and an LRV were to stop simultaneously, they may completely block the street. Also, transit patrons may run between the island and the curb bus stop through moving traffic. A number of pedestrian accidents of this type on Market Street have led to the current policy of staggering the bus and car-stops.

- Stagger the bus and car-stop on opposite sides of an intersection (one nearside and the other farside). Thus, there would never be a complete blockage of traffic flow. This could potentially double the number of parking spaces to be removed. Waiting transit patrons would either have to choose which type of vehicle they were going to take (thus reducing the effective frequency of transit service) or run across an intersection in order to take full advantage of the transit headway. Since the traffic signal is green for only one crosswalk at a time, the patron must either anticipate a full cycle in advance (50-80 seconds typically), predict which vehicle will come first or cross one or the other of the streets illegally. This discourages transferring between lines.

- Bulb the curb and sidewalk out to meet the LRV tracks. This would be the safest option for pedestrians since on a sidewalk they are less likely to be hit by careless drivers than pedestrians standing on an island. Both buses and LRVs could use the bulbed stop, thus improving the effective headway. This solution would have the least on-street parking effect, since the pull-in or pull-out space for the buses would be eliminated. This feature would work only for two-lane streets, and traffic would be completely blocked when a transit vehicle is stopped.

- Run the LRV along the curb. Pedestrian safety and effective headways would be the same as for bulbing. This solution would require elimination of all parking, standing or loading along the curb. This would be considered acceptable when parking is already not permitted.

Tracks in Pavement. Where the J Line Connection tracks share the right-of-way with motor vehicle traffic, the tracks in the pavement would create the following hazards for all build alignments:

- In wet weather the tracks would be more slippery than the regular pavement, creating a possible hazard for automobiles, pedestrians and bicyclists.

- At dips and downgrades the LRVs throw sand, which may pile up and make the street more slippery for motor vehicles.

- Bicycles and mopeds must avoid the tracks, since their narrow wheels can fall into the flange slot.

In cases where there are four or more travel lanes, motorists tend to avoid the track lane. This is in line with established policy to separate the LRVs and traffic where possible.

b. Impacts for San Jose Avenue Alignment

30th Street Segment. The LRV would block the traffic lanes during its stops at Dolores Street.

A new special LRV signal would have to be added to the 30th Street and San Jose Avenue traffic signal. Southbound, the LRV could turn right from 30th Street to San Jose Avenue during the regular 30th Street green phase. Northbound, the LRV would require a

separate phase, since both the southbound traffic and the 30th Street traffic must be kept out of the intersection during the LRV turn. With the tight-radius 120-degree curve, a two-car Muni Metro train would take approximately 33 seconds of green time to clear the intersection (a one-car train would take 23 seconds); thus, in the worst case during the p.m. peak the LRV phase would use seven seconds of every six minutes of the critical southbound traffic green signal. This represents a three percent loss of capacity for southbound San Jose Avenue traffic or change from a volume/capacity ratio of .86 to .89, both in the D level of service range (see Appendix C, page A-12 for a description of levels of service). Thirtieth Street would lose in the worst case one out of every four and one-half traffic signal cycles, and change from a volume/capacity ratio of approximately .5 to .6, or a level of service B to C.

The geometrics of the 120-degree left turn, San Jose Avenue to 30th Street, would require removing part of the median island on the south side of the intersection. For pedestrian impacts see Section IV.C.3.b, page 107.

San Jose Avenue - 30th Street to Dolores Street Segment. The J line would share the center lanes with traffic between 30th Street and Dolores Street; south of Dolores Street, the LRVs would be in a separate right-of-way. A new traffic signal would be needed to separate the LRVs from the San Jose Avenue to Dolores Street left-turn northbound traffic movement.

San Jose Avenue - Randall Street Intersection and Station Platform. The major impact of a separate right-of-way for the J line south of Dolores Street on San Jose Avenue, and of a station platform at Randall Street, is that the existing four lanes of traffic each way would be reduced to three lanes each way. The impact would be to increase the level of congestion in both a.m. and p.m. peak hours in the peak direction from service level D to service level E.

San Jose Avenue - Randall Street to Glen Park. Between Randall Street and the Monterey Boulevard on/off-ramps, the addition of the Muni Metro right-of-way in the median would have no noticeable impact on traffic flow because the number of traffic lanes would remain the same (three each way). Between the Monterey Boulevard on/off ramps and the I-280 on/off ramps, the number of traffic lanes would be reduced to two lanes in each direction through the Bosworth Street undercrossing. Two lanes can easily handle the

2,000 southbound p.m. peak-hour vehicles. Northbound, the San Jose Avenue and I-280 off-ramp traffic would have to merge into two lanes instead of the existing three. In the a.m. peak hour, the 2,400 northbound vehicles in the merge would change from Level of Service C to that of D (see Appendix C, page A-12 for a description of levels of service for freeway conditions).

This may be viewed as consistent with the established policy in San Francisco to give preference to transit over private cars, as stated in the San Francisco Master Plan.

A modest reduction of the capacity of San Jose Avenue would make little difference in the origin-destination pattern in the northbound a.m. peak period as long as the I-280 freeway backs up (LOS E and F) in the morning eastbound towards US-101, and US-101 itself is fairly slow moving up to its junction with the Central Freeway. Collectively the motorists will in effect make very fine shortest travel time calculations and the traffic will spread out over all available roadways. For the "thru" motorists (those 60% going outside the Mission District)[12] the effect of a slightly slower speed in the San Jose Avenue section is small compared to the delays associated with the traffic signals and congestion in the Inner-Mission or the stop-and-go traffic on the freeway.

San Jose Avenue - Glen Park to Theresa Street. The existing single lane of traffic each way through the I-280 undercrossing would remain. With the Muni Metro tracks in the median, the geometry of the S-curve through the undercrossing would limit actual motor vehicle speed southbound to 25 mph, as opposed to the existing 30 mph.

Mitigation Measures. Mitigation measures will be implemented to maintain public safety through the S-curve underpass. Some of the measures under consideration include:

- Lane striping so that the through movement is onto the I-280 on-ramps, and that it takes a definite left turn to continue on San Jose Avenue.

- Overhead sign changes, and pavement markings to indicate to the motorist that a left-turn is required in order to continue south on San Jose Avenue.

- Sign that calls San Jose Avenue lane a 'ramp' and calls for a 25 miles per hour speed.

In order to improve the safety within the 'S' curve, the trackway would be deliniated by special raised paving, similar to the Judah Street treatment only with a lower pavement edge height. The median barrier would be retained in order to separate opposing traffic.

San Jose Avenue - Theresa Street to Ocean Avenue. The J Line Connection vehicles would share the right-of-way with automobiles from Theresa Street to Ocean Avenue. With six-minute headways, the LRVs would have minimal impact on traffic operation except at the station stops. Three stops are proposed: between Baden Street and Pilgrim Avenue and between Paulding Street and San Juan Avenue, with far-side stops at Ocean Avenue. The first two would have platforms one-and-a-half inches, which would delineate the pedestrian safety area while allowing the fronting residents to reach their driveways.

San Jose and Ocean Avenues Intersection. The Ocean and San Jose Avenues intersection signal would require a demand-actuated third phase for the LRV movement in or out of Muni Metro Center. In the a.m. peak hour, the traffic level of service would go from C to D, and in the p.m. it would remain at level of service C, if the J line terminates at the Metro Center. If the J and M lines are through routed, then there would be little impact on traffic flow since the LRVs would stay on San Jose Avenue and not enter Metro Center.

c. Impacts for Monterey Boulevard Alignment

30th Street Segment. Impacts for this and the following segments would be identical to those for the San Jose Avenue Alignment described above (see Section IV.C.1.b., page 84).

San Jose Avenue - 30th Street to Dolores Segment. See Section IV.C.1.b., page 85.

San Jose Avenue - Randall Street Intersection and Station. See Section IV.C.1.b., page 85.

San Jose Avenue - Randall to Glen Park. See Section IV.C.1.b., page 85.

San Jose Avenue Subalternative - J Line Right-of-Way in Outside Lanes, Dolores to Monterey. An alternate method of ramping up from San Jose Avenue to Monterey Boulevard in the Glen Park area would be to share the use of the existing Monterey Boulevard on/off ramps to San Jose Avenue. The tracks would then be on the outside (curb) lanes. For northbound tracks a special traffic signal phase would be needed to

protect the LRV when it crosses the northbound traffic lanes at either Dolores Street or 30th Street. Southbound, the LRV would enter the San Jose Avenue curb lane from 30th Street either via an S-shaped curve which would twice cross all the southbound San Jose Avenue traffic lanes, or via the existing Dolores Street entrance with San Jose Avenue.

With curbside right-of-way the LRV would have to share its right-of-way in the Bernal Cut because of safety issues associated with right turns southbound at the Arlington Street and Monterey Boulevard off-ramps, and northbound turning into or out of Rousseau and Milton Streets, St. Mary's Avenue and at Randall Street. The existing bicycle path would be retained.

Use of the curb lane as opposed to a median right-of-way would mean that the LRV station at Randall Street would use the sidewalk rather than an island, and the LRVs would share the outside fourth lane; consequently, the existing four traffic lanes for each direction on San Jose Avenue could be maintained. The bicycles and pedestrians waiting at the station would share the sidewalk. Thus the bicyclists would be required to walk their bicycles through this area. Southbound Dolores Street would continue to have its own lane. Traffic would be forced into three lanes when an LRV is standing at the stations, otherwise the LRVs would flow with the traffic. For the Dolores Street Alignment two all day parking spaces and four parking spaces with 4:00 to 6:00 p.m. tow-a-way zones would be lost.

In addition, 21 parking spaces would have to be removed northbound on San Jose Avenue between Rousseau Street and St. Mary's Avenue.

For the San Jose Avenue and 30th Street northbound alignment, the outside-lane subalternative would require eliminating all parking and standing in front of the residences between Randall and 30th Streets. An estimated 14 spaces would be lost on the east side of San Jose Avenue, and six spaces on the west side. Of the residential units affected by the loss of parking, two do not have off-street parking between Kingston Avenue and Brook Street, plus the ten units in the apartment house on the southeast corner of 30th Street and San Jose Avenue.

In the outside-lane subalternative, with the J line operating in the outside lanes in the Bernal Cut, the line would re-enter the surface street system via the San Jose

Avenue/Monterey Boulevard on/off-ramps and go through the Diamond Street/Circular Avenue intersection.

The two subalternative alignments, in the median lanes or in the outside lanes through the Bernal Cut, would require different ramping arrangements between San Jose Avenue and Monterey Boulevard/Circular Avenue. The outside-lane subalternative would use the existing ramps (structurally strengthened), while the median-lane subalternative would use new structures touching down directly at the Monterey Boulevard/Circular Avenue intersection. The first subalternative alignment would use one block of Circular Avenue between Diamond Street and Monterey Boulevard. For the outside lane subalternative the stations would be as follows:

- The inbound station at Circular Avenue and Diamond Street would be on the San Jose Avenue on-ramp and would occupy the left lane of the two lanes with a safety island between the right and left lanes. A new sidewalk on the east side of Diamond Street connecting to the existing off-ramp crosswalk and a new crosswalk across Circular Avenue would provide access to the pedestrian island. A new pedestrian-activated signal would be installed to help the pedestrians cross the Circular Avenue traffic.

- The outbound station would be on the San Jose Avenue off-ramp as a nearside curb stop at Diamond Street. The existing demand-actuated pedestrian-only signal phase to protect the Diamond Street crosswalk would be modified to include the LRV crossing. The pavement markings would indicate that the left-hand lane was for through traffic only, to help prevent motor vehicles from right turning in front of a stopped LRV. Curb parking would be prohibited on the north side of Circular Avenue. At both ramps the loss of a lane would change the level of service from A to B.

Circular Avenue/Monterey Boulevard/I-280 On/Off-Ramp Intersection. For the outside-lane subalternative, the inbound trains would use the present left lane of the double left turn (Monterey Boulevard eastbound to Circular Avenue northeastbound). The traffic impact would be minimal. Outbound trains would use the present right-turn channelization, but because the train must use the center lane on Monterey Boulevard, this movement would be prohibited during the Monterey Boulevard off-ramp (westbound) phase

of the traffic signal. The train movement would be allowed during the other two phases. Once every six minutes the existing free right turn could be temporarily blocked if the outbound LRV arrived during the off-ramp signal phase.

With the median lane subalternative the LRV approach would add a fifth leg to the Circular Avenue/Monterey Boulevard/I-280 ramp intersection. Intersection design constraints require that the stop bars for both the southwest-bound Circular Avenue approach and the I-280 off-ramp approach be moved back, thus increasing the size of the intersection and reducing its efficiency. Inbound LRVs would use the right-hand of the Monterey Boulevard to Circular Avenue double-left-turning lanes and the existing Monterey Boulevard eastbound signal phase. Outbound LRVs would require a special fourth signal phase, which would be substituted for the Circular Avenue green phase. The impact of the loss of one out of every five green phases would create only temporary backups for motorists on Circular Avenue because Circular Avenue has low traffic volumes and the length of the Circular Avenue green phase is at present determined by the needs of the crosswalk across Monterey Boulevard and not by the volume of traffic. The present fixed-timed traffic signal operation would be maintained (with the addition of a presence detector to extend a phase for two-car trains as needed).

Monterey Boulevard. Along Monterey Boulevard the principle traffic impact would be at the car stops (see Section IV.C.1.a., page 82). On four-lane streets, Muni prefers to install 150-foot-long loading islands to accommodate two-car trains. The platforms would restrict the street space and thus tend to slow motorists, as do the present stop signs. For the motorist, this would be an inconvenience, but for the residents, slower-moving traffic may be considered a benefit. When an LRV is at the car stop, traffic would be forced into the other moving lane.

Gennessee Street. Two-way LRV operation on Gennessee Street would require removing parking from one side of the street between Monterey Boulevard and Staples Avenue and from both sides of the street between Staples and Judson Avenues for a loss of 32 spaces. All residential units have off-street parking.

Other subalternatives in the section between Monterey Boulevard and Phelan Avenue are possible. Those which did not require banning parking would require implementing a one-way street pattern. Gennessee Street would be preferred because it does not have grades

higher than nine percent (as Foerster Street does, between Staples and Judson Avenues); it is the widest street, with pavement 36 feet wide in the section between Monterey Boulevard and Staples Avenue. Two-way use of Gennessee Street would minimize the length of narrow residential streets needed for the LRV alignment.

Judson and Phelan Avenues. Along Judson and Phelan Avenues between Gennessee Street and Ocean Avenue, the J line would operate down the center of 58 to 60-foot-wide two-lane streets. The street is wide enough to accommodate islands and generous lanes for through traffic if parking were banned next to the LRV platform. During City College class - change times, pedestrian crossings and automobile turning movements in and out of parking lots would create a safety hazard necessitating a reduction in the LRV speed. Vehicles turning left across the tracks to enter or exit the parking lots could conflict with LRV movements. Although San Francisco City College is a major trip end, the LRV would only marginally reduce traffic levels, since the 12 line already serves SFCC from the Mission District.

Phelan, Ocean, Geneva Avenues Intersection. Operation of J-line vehicles through the Phelan, Ocean and Geneva Avenues intersection would require modification of the traffic signals. A special signal phase to indicate the LRV right turn from Ocean Avenue onto Phelan Avenue would be activated by the track switch. Because the storage space on Ocean Avenue between Phelan Avenue and Geneva Avenue is not long enough to store a two-car train (it is long enough to store a one-car train), the Geneva Avenue approach traffic would lose one cycle whenever a two-car train was used on the J line. Since in peak periods the Geneva approach green phase is often fully loaded, the loss of a phase would mean that a queue would form and that a motorist may have to wait through several cycles before being able to enter the intersection. The added traffic load of a J line LRV would most impact the intersection in the early evening - i.e. 6-7 p.m., at start-up of the evening classes at City College. This would overlap the end of the p.m. rush hour (which creates a large westbound traffic flow on Geneva Avenue) and also would coincide with the pull-in time for the Muni Metro vehicles, at which time they would be most likely to be coupled into multiple car trains.

If, during the p.m. peak, the queue of cars on Geneva Avenue backed up southwards over the small hill, then some motorists would begin to detour via Howth Street to Ocean Avenue. Although Ocean Avenue would also be carrying heavy westbound loads, the

Ocean Avenue green phase could be lengthened to accommodate heavier loads. (The Geneva phase cannot be lengthened since it is restricted by the inner intersection storage space.) The overall impact would be to change from level of service D to level of service E.

Ocean Avenue. The J line LRVs would use the existing Muni Metro semi-exclusive right-of-way in the median of Ocean Avenue. The only traffic impact would be an increase in the number of LRVs using the special signal at the I-280 eastbound on-ramp to enter or leave Muni Metro Center.

If the J and M lines are through-routed, then this entrance would not be used by the J and M lines, though it still would be used by the K line. With the J-M through-routing, the LRV turn movements at Ocean and San Jose Avenues would occur during the regular signal phase. With six-minute headways, the impact of the J-M route would not be great.

d. Impacts for Mission Street Alignment

Thirtieth Street Segment. Impacts on this segment would be as described in Section IV.C.1.b., page 84.

Mission Street. The impact of Muni Metro tracks on Mission Street would be to widen the center lanes at the expense of the outside lanes. Currently the 58-1/2-foot pavement width has two 10-foot center lanes and two 19-foot 3-inch outer lanes. With eight feet needed for parking, the travel way in the outside lane is 11 feet 3 inches. Even so, depending upon the geometry of the bus stop and the size of the nearest parked vehicle, the 8½-foot-wide buses must often encroach on the center lane when pulling out of a bus stop. With 11-foot minimum distance between track centers and five feet minimum between the track center and the nearest moving traffic lane, the combined center lanes would be 21 feet wide, or 10-1/2 feet individually. The loss of one-half foot to the outside lanes would marginally impair the traffic flow in the outside lanes more than the gain of one-half foot would improve the flow in the center lanes. This would be due to the increased side friction from parked vehicles, the reduction in the side clearance needed by buses for smooth traffic flow, the reduction in clearance between moving vehicles and buses in bus stops, and the greater possibility that a bus would have to encroach on the center lane in order to pull out of a bus stop.

The presence of passenger-boarding islands would slow moving vehicles. This is desirable for the safety of the waiting passengers. The motorists, however, would perceive it as a hindrance, since they tend to avoid fixed objects. Thus, a 10-foot 3-inch center lane next to an island is perceived by the motorist as much narrower than a 10-foot 6-inch clear lane. With six-foot-wide platforms, the outer lane would be 14 feet from curb to island, with no parking allowed.

The traffic impact of the J line LRVs on four-lane Mission Street would be greater than if the equivalent number of buses were added. The buses, pulling in and out of the bus stops and generally moving slower than the vehicular traffic, tend to dominate the outside lanes. This, coupled with the friction associated with parking, would mean that traffic would travel, where possible, in the inner lanes. The exception is where left-turning vehicles block the center lanes, thus forcing the traffic back into the outer lanes.

An LRV running in the center lane would form a sight barrier for the drivers of following vehicles. These drivers would no longer be able to see vehicles waiting to make left turns and so would tend to avoid directly following an LRV. This problem is compounded at the LRV stop locations, at which an LRV would stop all traffic in the center lane. Thus the LRVs would tend to encourage motorists to travel in the outside lanes. Consequently, even though buses would tend to stay in the outside lane and would generally avoid running on the tracks in the center lane, buses and LRVs would interfere with each other's operation by effectively pushing motor vehicles into the other's lane.

Mission and 30th Streets Intersection. The geometrics of the outbound (southbound) LRV turn from 30th to Mission Street would require encroaching several feet onto the property on the southwest corner, a gas station, in order to make the right-turn. This would improve the capacity of the intersection as a whole and facilitate right turn movements. The required lengthening of the crosswalk would not require any change with the traffic signal timing.

Mission Street and Ocean Avenue Intersection. A right turn from the center lane on Mission Street to Ocean Avenue would require a separate signal phase as the LRV crossed the outside Mission Street traffic lane. The impact would be to reduce the southbound capacity at the Ocean and Mission traffic signal by approximately ten percent which would represent an estimated reduction in level of service from C to D. The left turn would not require any special provisions.

Ocean Avenue. Ocean Avenue is sufficiently wide to permit at car stops the separation of the motor vehicle travel lane from the LRV lane; however, this would require that parking at the car stops be removed from one side of the street, and that the car stops for opposite directions be staggered. Thus, from the through-traffic point of view, LRV operation would have little impact. On the average, five parking spaces would be lost per car stop.

Parking. LRV operation would have no impact on parking along 30th Street. The impact of LRV car stops along Mission Street would be the removal of the adjacent parking for the length of the 150-foot-long passenger islands plus, ideally, 150 feet more at either end as a taper to provide a smooth flow. With the generally short blocks in the area, one or both ends would be at the intersection so the taper would not be required, but parking for the full length of the block would be removed or approximately 15 spaces for a stop in both directions. At least one stop would be needed in the Excelsior shopping district, necessitating removal of meter parking.

The impact of LRV stops along Ocean Avenue would be the removal of parking alongside the LRV passenger island. Positioning the car stops at existing 12 line bus stops would minimize the parking take.

e. Impacts to No-Build Alternative

There would be no traffic changes under the No-Build Alternative.

2. Transit

a. Impacts Common to the Three Build Alternatives

Route Impacts. The Muni 1980-1985 5-year Plan is to through-route the J line (extended to Metro Center) with the M line to form a loop. An alternative is to have the J, M and K lines all terminate at the Metro Center. Because of speed restrictions inside the Metro Center, terminal loops within the Center take four minutes to make. The J-M loop line, in conjunction with the 54-Felton (along Sagamore Street and Alemany Boulevard), would replace the current outer part of the 26-Valencia route, and the 26 motor coach would be rerouted south of Glen Park BART station via Bosworth Street, Lyell Street, Alemany Boulevard and Silver Avenue to connect to Mission Street; plus a terminal loop east of Mission Street on Trumbull Street and Maynard Street. The 26 is also planned to operate

on Guerrero Street between 30th Street and Duboce Avenue rather than its present routing on Valencia Street.

Unlike the existing 26-Valencia routing, which terminates at San Francisco State University, its replacement, the J-M loop route, would provide direct access from the Mission and Ingleside Districts to Stonestown Shopping Center as well as to San Francisco State. Furthermore, unlike the existing 26-Valencia, the J Line Connection on San Jose Avenue would provide a direct line between the San Jose Avenue area with Noe Valley, lower Eureka Valley, the Duboce Triangle and the N line serving the University of California Medical Center and the Inner Sunset. However, with the J Line Connection, travel between San Jose Avenue area and the Valencia Street or the downtown section of Mission Street could require a transfer at 30th Street, which is not the case with the existing 26 route.

Route Changes. There are two distinct viewpoints with respect to changes in transit routes: that of the user and that of the public at large, which is similar to that of the transit operators.

From the transit operator's point of view as well as from that of the public, the long-run operational impacts would be central and critical. The San Jose Alignment would save in overall vehicle and operator hours while providing service to a new section of the route. This potential for savings is detailed on page 67. For all three alignments, the J and N line routes would bypass the West Portal and also have fewer reversals at The Embarcadero Station, thereby reducing the congestion at these critical points by a projected 78 car movements per day, thereby improving Muni Metro operation.

To obtain the full benefit of these potential savings for the N line, a left-turn track between Church Street and Duboce Avenue would be constructed (the right turn already exists).

From the point of view of the public and the transit operators, what matters over the long run is the increase in the total transit system's patronage, not how a particular line gains or loses riders. In the short run due to a route change there may be more or less crowding on a particular line or section of a line. In the interim, however, patronage levels and headways tend to balance out as new schedules are made.

For an existing or potential transit patron, the attractiveness of a transit trip to a destination is what matters. This attractiveness is a function of overall travel times and the degree of inconvenience associated with making the trip and the cost. Travel times are a function of walking distance, the time waiting for a transit vehicle (or the headways), the travel speeds and the number of transfers required. Research has shown that waiting time has a much higher subjective value than does riding time; hence the importance of short headways to attract maximum patronage. The degree of inconvenience associated with a transit trip is the number of transfers required, the length of the waiting periods required, and the sense of reliability (whether the transit vehicle would show up on time and whether the waiting patron may be bypassed because of overcrowded vehicles).

In the short run an existing user may experience the increase or decrease in patronage on a particular line due to a change in routing as an increase or decrease in crowding on the transit vehicle and/or as a slowing down or speeding up of the trip travel time. In the long run, however, the headways on a more crowded route will be improved; on the other hand, there will be pressure to lengthen the headways if a route is under-utilized. Consequently, from the user's point of view, increased patronage on a line is a mixed blessing: it means more crowding and slower trips but improved headways. In general, the added convenience of headway improvements outweigh the disadvantages; thus, the more heavily used transit route will have better headways and will attract even more ridership compared with a parallel line that does not have a frequent service. In San Francisco, examples of this phenomenon are the heavy use and good headways of the Mission Street lines versus the 26-Valencia, and, likewise, in the Richmond District, the heavy use and good headways of the 38-Geary versus the 31-Balboa or the 2-Clement.

In May 1982 the K and M cars were through-routed on Ocean and San Jose Avenues in order to eliminate the need to negotiate the runaround loop at Metro Center, which takes 4 minutes exclusive of stop time. The Muni 5-year Plan calls for through routing the J and M lines and it is anticipated that if the J line is connected that the K line would be terminated at Metro Center and the J and M lines through-routed, since this route has greater patronage potential than the K-M route. The other option, a J-K route, does not directly serve the Balboa BART station. The last option is for all routes to use the Metro Center station platforms.

With J-M through-routing potential a capital cost savings would be realized if the J line entrance to Metro Center at Ocean Avenue and San Jose Avenue were eliminated from the project. For the San Jose Avenue and Mission Street alignments, if this entrance were eliminated from the project it would be necessary to either rebuild the existing Metro Center entrance at Geneva Avenue or on Ocean Avenue to allow for the J line (and N line pull-in and pull-out) cars to exit and enter the Metro Center directly, or if this were not done a reversing movement would be necessary. J line-bound cars would have to use a reversing movement from the Metro Center loop to get onto the northbound track of the J-M routing on San Jose Avenue. This would require a flagperson and in all probability could add confusion to the intersection, especially for northbound vehicles. Reversing movements requires increased operating cost which over the long run may offset any capital cost savings.

One operational alternative for the J line would be to turn back every other car at 30th and Church Streets. The inner part of the route would thus have six-minute headways while the outer part would have 12-minute headways. This 12-minute headway would approximately match the current 10-minute peak-hour headway of the 26 bus (11-minute headway midday). Through-routing of the J and M lines would require that every other M car also be turned back at either the Metro Center or at 19th and Holloway Avenues where there is an existing switch back. This latter location is also a major destination (San Francisco State University).

Patronage Projections. The 1975-1977 Muni Planning, Operations and Marketing (POM) Study made computer-network-based patronage projections of the recommended transit network which became the basis for Muni's 5-year Plan route reorganization. The POM network did not include the connection of the J line, because it would have been outside the study's 5-year time frame and the non-capital-intensive route restructuring goal. Due to the interest in the J Line Connection, however, a manual estimate of the J Line Connection patronage was completed by the POM study staff, which extrapolated from the computer-network-generated factors and used the same patronage modeling procedure. The general stability of transit travel patterns in San Francisco (aside from growth in downtown office workers) means that the the POM-observed patronage projection remains the best available in lieu of a new on-board survey.

This patronage projection assumed:

- 30th Street & San Jose Avenue J line routing
- 26 bus line would not operate south of Glen Park BART Station
- Patronage would be essentially constant with respect to this corridor for the forseeable future. Six-minute headways for the J line in the peak periods
- BART major mode to Central Business District from San Jose Avenue corridor.

The patronage analysis was done for both the J line terminating at Metro Center and for a J-M loop line operation.

Use of the Muni Fast Pass for intra-San Francisco BART trips is tentatively scheduled to begin late in 1982. When and if this occurs, BART will function as an integral part of the Muni system and the added cost of using both BART and Muni will no longer deter joint trip making. Both the 14X-Mission Express and the 14GL-Guerrero Limited, peak-hour-only routes that serve the Outer Mission, are scheduled to be discontinued with the advent of the Fast Pass acceptance on BART. The patronage impact for the proposed J Line Connection of Fast Pass acceptance on BART, would not be expected to be great, since BART already carries most of the downtown trips from the San Jose Avenue corridor.

Patronage changes are estimated under the individual alternatives below.

b. San Jose Avenue Alignment

Neither the J line Connection to Metro Center nor the J-M loop routing under this alternative would duplicate any other Muni service, except for a short stretch along 30th Street and for the rerouted 26 buses between the Glen Park BART station and Mission Street and Silver Avenue.

Connections and Transfers. The J line would have a station stop at Randall Street, a short distance from the Mission Street trunk routes; this is anticipated to be a heavy transfer point.

Compared with the present transfer with the 26 bus at Bosworth and Diamond Streets, transfer between the J line and Routes 10, 44 and 52, or to BART from the San Jose

Avenue car stop next to the Glen Park BART Station, would require an additional 200 feet of walking distance, plus climbing a 20-foot stair.

Travel Times. The travel time for the J Line Connection between 30th and Church Streets to Metro Center (Balboa Park Station) is estimated to be 11 minutes. This is the same as the average time the 26-Valencia bus takes to travel between 30th/Chenery Streets and San Jose/Geneva Avenues. The Dolores Street Subalternative alignment travel speeds would average approximately half a minute faster (one-way) than the 30th Street and San Jose Avenue Subalternative alignment, depending on the direction of travel, the time of day and the details of the traffic signal phasing.

Table 11, page 100, compares the running times of the existing conditions with the proposed alternative for selected trip origin and destination pairs (called O-D pair). From the San Jose Avenue Corridor, travel to downtown via BART would be faster than any other transit route, even if a transfer is involved (see O-D pairs III, IV and V). From Metro Center (Balboa Park station), the K line would be faster than the J line (O-D pair III). From Inner Mission to San Francisco State College is shown in O-D pair VI. The six minute headways of the J-M line improve the total travel times over the 10 to 11 minute headway of the existing 26 line.

Patronage. The estimated change in Muni's total patronage due to the J line Connection via the San Jose Avenue alignment would be 1,200 to 1,500 additional daily riders if the J line Connection terminated at the Metro Center and 2,500 to 3,000 additional riders if the J and M Lines were through-routed. These figures represent anticipated new trips on Muni; the actual patronage on the J line Connection would be a combination of these new trips plus diversion from the 26 bus route. Due to the competive travel times of BART in this corridor these new riders are not primarily downtown oriented; therefore, it is not expected that additional vehicles would be needed at the J line's Duboce Portal maximum load point. Much of the increased ridership would be in the reverse peak direction towards SFSU and Stonestown.

This patronage estimate assumes that downtown commuters would continue to use BART where possible. The estimated increase in patronage would be due primarily to improved connections, the increased capacity to take surges of patrons from schools and colleges, the superior ride quality and overall attractiveness of the Muni Metro vehicle, and the

TABLE 11

REPRESENTATIVE AM PEAK TRAVEL TIMES
(On-Board Running Time)

Origin/ Destination Pair	Origin	Destination	Route	Average Running Times in Minutes: Existing Travel Time (Minutes)	San Jose Alignment	Monterey Alignment	Mission Alignment
I	Ocean and San Jose (Metro Center)	30th & Mission	via 26	11	11	17	21
II	30th St. and Church	Montgomery Station	via J	28	28	28	28
	30th St. and Chenery	New Montgomery	via 26 and 14*	28	28	28	28
III	Metro Center (Balboa BART)	Embarcadero Station	via K	40	40	40	40
	Metro Center	Embarcadero Station	via M	47	48	48	48
	Metro Center	Embarcadero Station	via J	-	39	43	49
	Balboa BART	Embarcadero Station	via BART	16	16	16	16
	Metro Center	Mission & Beale	via 26 and 14*	40	40	40	40
IV	Glen Park Station	5th & Mission	via 26	29	29	29	29
	Glen Park Station	Powell Station	via J	-	31	32	-
	Glen Park Station	Powell Station	via BART	10	10	10	10
	Silver and Mission	5th & Mission	via 14	26	36	36	36
	Silver and Mission	Powell Station	via J	-	-	-	37

TABLE 11
(continued)

V	"Mid Corridar"	Mantgomery Station	with transfer at Glen Park				
	Santa Rosa & San Jose	Montgamery Station	via 26 and BART*	21	21	21	21
	Manterey & Gennessee	Montgamery Statian	via 10 and BART*	21	21	21	21
	Brazil & Mission	Mantgomery Statian	via 52 and BART*	21	21	21	21
	Brazil & Missian	New Mantgamery and Mission	via 14	38	38	38	38
	"Mid Carridar"	Mantgamery Station	via J	-	34	34	39
VI	"Inner Missian" (24th Street)	S.F. State University (19th & Holloway)					
	24th & Mission	S.F. State University	via 12 and 26*	34	34	34	34
	24th & Missian	S.F. State University	via 12 and J-M**	30	30	30	30
	24th & Mission	S.F. State University	via BART and 26*	20	-	-	-
	24th & Mission	S.F. State University	via BART and J-M**	20	20	20	20
	24th & Valencia	S.F. State University	via 26	27	-	-	-
	24th & Church	S.F. State University	via J	23	23	23	23

* Transfer time assumed one-half headway of secand raute.

** Also existing K-M route.

Source: BART Schedules, Muni running-time checks and schedules, and estimates far new segments.

ease of learning the route. A rail route is more easily learned and understood by would-be patrons because the vehicles are unique and the tracks give the route high visibility. Neighborhood residents would soon have an idea as to the route, even if they seldom used public transit.

Operational Impacts. The J Line Connection could potentially save operational costs by reducing travel times between the Metro Center and the ends of the J-Church and N-Judah Muni Metro routes. For the J line the savings under this alternative would be an estimated 1,030 minutes per weekday. For the N line the savings would be an estimated 850 minutes per weekday. Combined, the savings would be 9,250 vehicle-hours per year.

A new (far-side) bus stop for the Mission Street buses at Randall Street would be needed to maximize the transfer potential of the Randall Street LRV Station. The impact on the Mission Street bus routes would be small increases in travel times. Some of the transfers currently taking place at 30th and Mission Street would move to Randall Street.

c. Monterey Boulevard Alignment

The J Line Connection via Circular Avenue, Monterey Boulevard, Phelan Avenue and Ocean Avenue would not serve the section of San Jose Avenue between Baden Street and Ocean Avenue currently served by the 26 route and thus would require a revision in Muni's 5-year Plan if this section is to be served. The most likely resolution would be to continue the 26 route south to a terminus at Geneva Avenue to connect with all the routes serving Balboa Park Station. The consequence would be that Trumbull and Maynard Streets on the east side of Mission Street would lose their planned service by the 26 route.

The Monterey Boulevard Alignment for the J Line Connection would duplicate service for sections of routes:

- 10-Monterey, on Circular Avenue and Monterey Boulevard
- 12-Ocean, on Ocean Avenue
- 36-Teresita, on Foerster/Gennessee Streets, Phelan and Ocean Avenue
- 43-Masonic, on Foerster/Gennessee Streets, Phelan and Ocean Avenue
- K-Ingleside, on Ocean Avenue

The K, 12, 36 and 43 duplications would increase the frequency of transit vehicles between Balboa Park Station and City College. The duplication of the 10-Monterey service would likewise improve service along Monterey Boulevard between the Glen Park BART Station and Foerster/Gennessee Streets. However, since this alternative would duplicate the maximum load section of the 10 route the long-run effect may be to reduce service frequencies for the 10 route as a whole (since there is always pressure to adjust headways to serve the headways of the maximum load of a route). As described in Section IV.C.2.a, duplications of service in general mean that sections of routes may have excess capacity, while elsewhere in the transit system other routes may not have as good service as would be possible if the duplication were eliminated.

Connections and Transfers. Transfers between the J line and routes 37, 44 and 52 at the Diamond Street and Circular Avenue car stop, as well as to BART at the Glen Park BART Station, would require additional walking distance compared with the existing 26-line stop at Diamond and Bosworth. Patrons from the Glen Park BART station waiting for either the 10 or J line for a trip west on Monterey Boulevard would have to wait at the intersection of Diamond Street and Circular Avenue, where they could see either the 10 bus or the J car approaching. If the 10 were to come first, then patrons would have to walk the short block down to Bosworth Street to board it.

Travel Times. The travel time for the J Line Connection on the Monterey Boulevard Alignment between 30th and Church Streets to Metro Center (Balboa Park Station) is estimated at 17 minutes. This would be six minutes longer than the 26 bus currently takes between Geneva Avenue and 30th Street.

Table 11, page 100, compares for selected trip destinations, the travel times of the existing conditions with those of the Monterey alternative. From the San Jose Avenue corridor, travel to downtown via BART would be faster than any other transit routes, even if a transfer is involved (see O-D pairs III, IV and V). From Metro Center (Balboa Park Station), the K line would be faster downtown than the J line (O-D pair III). From Inner Mission (24th Street) to San Francisco State College (O-D pair VI), travel via a J-M loop line would take an estimated 29 minutes which is nine minutes longer than the 26 bus currently takes.

Patronage. The estimated change in overall Muni patronage due to the J Line Connection via the Monterey Boulevard Alignment is 1,500-1,800 additional daily riders if the J line Connection terminates at the Metro Center, and 2,000-2,500 riders if the J and M lines are through-routed. These would be new Muni riders. The actual patronage on the J line Connection would be a combination of these new trips plus the diversion from the 26 bus route. These added riders would not be primarily downtown-oriented; therefore, it is not expected that additional J line vehicles would be required at the Duboce Portal maximum load point. Much of the increased ridership would be in the reverse commute direction, towards City College and SFSU.

Operational Impacts. The J Line Connection would provide the potential for operational efficiency by reducing the travel times between the Metro Center and the ends of Muni Metro routes. For the J line the savings under this alignment would be an estimated 915 minutes per weekday, and for the N line the time savings would be about 600 minutes per weekday. With the J and N combined the total savings would be 7730 vehicles-hours per year.

Several alternative routings between Monterey and Phelan would be on streets that already have bus service. As part of the December 1981 route changes, the 36 and 43 buses were rerouted to avoid current operational problems associated when buses meet on these relatively narrow streets. The proposed two-way alignment on Gennessee Street would, by banning parking on one side of the street (i.e. 32 parking spaces), provide sufficient street width so that two-way bus operation on Gennessee Street could also be resumed. Alternatively, one-way routing via Gennessee Street (southbound) and Foerster Street (northbound) could be utilized to avoid conflicts with the bus routes.

d. Mission Street Alignment

Route Impacts. The J Line Connection via Mission Street and Ocean Avenue would not serve the section of San Jose Avenue between Baden Street and Ocean Avenue currently served by the 26 route and would thus require a revision in Muni's 5-year Plan if this section is to be served. The most likely resolution would be to continue the 26 route south to Geneva Avenue, thereby connecting with all the routes serving Balboa Park Station. The consequence would be that Trumbull and Maynard Streets on the east side of Mission Street would lose their planned service by the 26 route.

The 30th Street, Mission Street, and Ocean Avenue routing of this J line Connection alternative would duplicate service for sections of the following Muni transit routes:

- 9-Richland, on Mission Street
- 12-Ocean, on Mission Street and Ocean Avenue
- 14, 14GL and 14X, on Mission Street
- 52-Excelsior, on Mission Street
- 54-Felton on Ocean Avenue.

The above duplications would increase transit vehicle frequencies and increase capacity along the Middle Mission Street and Ocean Avenue. Generally speaking, for the radial downtown-oriented Mission Street routes (as opposed to the feeder/crosstown routes 52 and 54), the maximum load points are in the Inner Mission (north of 30th Street). (The exceptions are the 14GL and 14X peak-only routes, and the 12-Ocean outbound in the a.m. peak, which have maximum load points along the J Line Connection segment of Mission Street). Since the increased transit capacity to the middle and outer portions of Mission Street attributable to the J line, would not correspond with the Inner Mission maximum load point for the Mission routes (with the above exceptions), the J line would not improve the capacity of the Mission Street bus routes.

As noted in Section IV.C.2.a, page 96, duplications of service mean in general that sections of routes may have excess capacity, while elsewhere in the transit system other routes may not have as frequent headways as would be possible if the duplication were to be eliminated.

Connections and Transfers. In addition to the connections listed in Section IV.C.2.a, the Mission Street J Line Connection Alignment would provide another connection for the Middle and Outer Mission with the Balboa Park BART Station and with the K and M lines. Although the 12-Ocean serves City College, it does not directly serve the Balboa Park Station which necessitates a 1,200-foot walk.

Travel Times. The travel time for the J Line Connection on the Mission Street Alignment between 30th and Church Streets to Metro Center (Balboa Park Station) is estimated to be 21 minutes. This is 10 minutes longer than the 26 bus currently takes between Geneva Avenue and 30th Street.

Table 11, page 100, compares, for selected trips destinations, the travel times of the existing conditions with those of the Mission Street J line alignment. From the San Jose Avenue corridor travel to downtown via BART is faster than any other transit routes, even if a transfer is involved (O-D pairs III, IV and V). Mission Street is slower than Valencia Street (O-D pair IV). From Metro Center (Balboa Park Station), the K line is faster downtown than the J line (O-D pair III). From the Inner Mission at 24th Street to SFSU (O-D pair VI), travel via a J-M loop line would be three minutes slower than travel via BART and transferring to J-M line at Geneva and San Jose.

Patronage: The estimated change in Muni's total patronage due to the J Line Connection via the Mission Street alignment is 2,000-2,500 additional daily riders if the J line terminated at the Metro Center and 2,000-3,000 additional riders if the J and M lines were through-routed. These would be new Muni riders. The actual patronage of the J Line Connection would be a combination of these new trips plus diversion from the 26 bus route. These added riders would not be primarily downtown oriented; therefore, it is not expected that additional J line vehicles would be required at the Duboce Portal maximum load point. Much of the increased ridership would be in the reverse of the peak direction.

Operational Impacts. The J line Connection would provide the potential for operational savings by reducing travel times between the Metro Center and the ends of the J-Church and N-Judah Muni Metro routes. For the Mission Street Alignment, the savings would constitute an estimated 840 minutes per weekday for the J line service, and 530 for the N line. This would constitute a combined savings 6,700 vehicle hours per year.

The slow-speed (7-8 mph) turning movements of the LRV at the intersection of 30th and Mission Streets, which currently has a number of bus turning movements and is a major transfer point, would potential conflict with other transit operations. Although the 24-Castro diesel bus currently (1982) operates on 29th Street, the plans for its electrificaiton are to move it back to 30th Street (as was the old 10 line it replaced), thus increasing the potential for interference between the various transit lines. The intention in the 5-year Plan to move the 26 from Valencia Street to Guerrero Street in the Inner Mission. If this occurs it would mean that this intersection would be freed of 26-bus turns which might interfere with the J Line Connection LRV turning movements.

3. Pedestrian Impacts

a. Impacts Common to All Alternatives

Car stops. As noted above (Section IV.C. I.a., page 82), the J Line Connection LRVs would run in the center traffic lanes. The standard practice for a century of street railway operations was for patrons to board from and debark onto the street pavement. For streets with light or moderate traffic flow this procedure still operates safely - for example, along Church Street, 17th Street, Taraval Street, outer Judah Street, Broad Street, or along the cable car lines. In recent years, with higher automobile usage, pedestrian islands have been built for safety at busier locations, such as along Market Street, where the danger to pedestrians was not just from automobiles but also from buses.

It is envisioned, therefore, that for those street sections with high traffic volumes and with four or more traffic lanes, that low-level station platforms be built at stop locations. The heavy traffic sections are: San Jose Avenue north of I-280, Mission Street, Monterey Boulevard, Phelan Avenue and Ocean Avenue west of San Jose Avenue.

A special problem in car-stop placement occurs where LRVs and buses would share the same streets. The options (see Section IV.C.I.a., page 83 for a full description), as they relate to pedestrians, are:

- Have the buses use the car stop platform. Transit patrons waiting for the bus or the LRV could wait at one spot and would not have to run back and forth depending on which comes first, thus improving pedestrian safety.

- Have the bus and car-stop platforms side by side. Transit patrons may run between the island and the curb bus stop through moving traffic. A number of pedestrian accidents of this type on Market Street have led to the current policy of staggering the bus and car stops.

- Stagger the bus and car stop on opposite sides of an intersection (one near-side and the other far-side). Transit patrons would either have to choose which vehicle they were going to take (thus reducing the effective frequency of transit service) or run across the intersection in order to take full advantage of the transit headway. Since the traffic signal is green for only one crosswalk at a time, the patron must either anticipate which vehicle will come first a full cycle in advance (50-80 seconds typically) or cross one or the other of the streets illegally.

- Bulb the curb and sidewalk out to meet the LRV tracks. Careless motorists are less likely to jump a curb and hit a pedestrian on a sidewalk than pedestrians standing on an island.

- Run the LRV along the curb. Safety for pedestrians would be the same as for bulbing.

Tracks in Pavement. Tracks would create an irregular street surface in crosswalks. Also, in wet weather tracks become more slippery than the normal crosswalk pavement.

b. San Jose Avenue Alignment

30th Street Segment

In the San Jose Avenue subalternative for this segment, the geometry of the 120-degree left turn from San Jose to 30th Street would require removal of part of the median island on the south side of the intersection. The loss of this pedestrian safety island plus the minimal green time allotted to the 30th Street phase would mean that the south crosswalk across San Jose Avenue would have to be eliminated. Observations of school-day crosswalk activity showed heavier usage of the northern crosswalk compared to the southern crosswalk. In the a.m. peak hour 60 pedestrians were observed to use the north crosswalk, while 20 used the south. In the p.m. peak 75 used the north and 45 used the south.[13] Some pedestrians would be required to cross 30th Street twice in order to cross San Jose Avenue.

Pedestrians would connect between the LRV station in the median of San Jose Avenue and the Glen Park area and BART station via a pedestrian overpass over the high speed southbound San Jose Avenue and I-280 on-ramp lanes. An at grade crosswalk across the Monterey Boulevard off-ramp would be a 100 feet north of the existing crosswalk and traffic signal at the Circular Avenue/Diamond Street intersection.

Mitigation Measures

If the project is built, pedestrian safety on the crosswalk of the San Jose Avenue to Monterey Boulevard off-ramp would be maintained by careful design, perhaps special signs, illumination, flashing amber lights, etc.

c. Monterey Boulevard Alignment

Subalternative San Jose Avenue Median Lane. Same as 3.C.b above.

Subalternative - J Line Right-of-Way in Outside Lanes, Dolores Street to Monterey Boulevard. The inbound station at Circular Avenue and Diamond Street would occupy the left lane of the two-lane on-ramp with a safety island between the right and left lanes. A new sidewalk on the east side of Diamond Street connecting to the off-ramp crosswalk and a new crosswalk across Circular Avenue would provide access to the pedestrian island. A pedestrian-activated signal would help separate the pedestrians from the Circular Avenue traffic as well as the outbound LRVs.

The outbound station would be on the off-ramp, as a nearside curb stop at Diamond Street. The existing demand-actuated pedestrian-only signal phase to protect the existing Diamond Street crosswalk would be modified to include the LRV crossing.

Judson and Phelan Avenues. During City College class-change times, there would be potential pedestrian-LRV conflicts at crosswalks.

d. Mission Street Alignment

The turning LRV's would possibly conflict with the heavy pedestrian flows at the 30th and Church transfer location. Since Mission Street already has heavy traffic flows and frequent buses, the addition of LRV's should have little impact on pedestrians. At station islands, the patrons would be more exposed to traffic hazards than they currently are at sidewalk bus stops.

D. NATURAL IMPACTS

1. Air Quality Impacts

Any local air quality impacts resulting from the operation of the proposed project would be due to the slowing of automobile traffic by tracks, car turns, car stops and changes in signalization. The regional impact due to the reduction in total vehicle miles traveled as a result of the predicted increased patronage on Muni would have a negligible impact on air quality (see Table 12, page 110). In addition, there could be a short-term local impact due to construction of the J Line Connection (see Section IV.E, page 129). Impacts at the facilities which generate the electricity to be used by the proposed project would not be of measurable or estimable magnitude.

TABLE 12

PREDICTED WORST CASE CO CONCENTRATION IN 1985[1]

	San Jose Ave.[2]		Monterey Blvd. Alignment[3]		Mission Street Alignment[4]	
	1-hr.	8-hr.	1-hr.	8-hr.	1-hr.	8-hr.
Without Project	26	9	21	8	18	7
With Project	26	9	21	8	18	7

[1]Details of the procedures used to generate these figures are contained in Appendix B, page A-7.

[2]These results are for the intersection of San Jose Avenue and Randall Street, and also apply to the Monterey Blvd. Alignment.

[3]Results are presented for the intersection of Ocean/Phelan/Geneva.

[4]Results presented for the intersection of Mission/Bosworth.

a. Local Impacts

Traffic movement would be impeded in several places under the various alternative alignments. However, local air quality impacts associated with these changes in level of service would be either unmeasurable or within federal standards. Local impacts were predicted for the intersections expected to have the greatest influence on level of service. They are:

San Jose Avenue Alignment. Level of service would decrease from D to E at the Randall Street/San Jose Avenue intersection. This would be due to a change in signalization and would occur during peak traffic periods.

Monterey Boulevard Alignment. Worsening of level of service would occur at the Randall Street intersection (as for the San Jose Avenue alignment) and at the Phelan, Ocean and Geneva Avenues intersection. In both cases level of service would be degraded from D to E. This would be due to a change in signalization and would occur during peak traffic periods.

Mission Street Alignment. Traffic flow at the intersection of Mission Street and Silver Avenue would be slowed when an LRV passed, occurring every six minutes during peak hours. Service levels would deteriorate at these times.

The impacts that would occur in each of the situations described above were estimated using the procedures recommended by the Bay Area Air Quality Management District for the evaluation of worst-case air quality impacts.[14] The results are presented in Table 12, page 110, which indicates that there would be no violations of the National Ambient Air Quality Standard governing one hour average CO concentrations of 35 ppm or the eight hour standard of nine ppm. The eight hour standard would be equalled but not exceeded at the intersection of San Jose Avenue and Randall Street under the San Jose Avenue and Monterey Boulevard alignments. Although the various alignments would increase traffic congestion at the locations addressed in Table 12, the resulting increases in CO concentrations would be within the expected range of error of the model and would not be measurable.

b. Regional Impacts

Any regional impacts due to the proposed project would be due to increases or decreases in total vehicle miles traveled (VMT) by vehicular traffic. The predicted change in VMT

for each alignment is presented in Table 13, page 113. As can be seen from the Table, these quantities represent a reduction of no more than 0.004% of total regional VMT annually and would not result in a measurable air quality impact.

c. Sensitive Receptors

Table 14, page 114 shows sensitive receptors such as schools, churches, parks and health centers located along the proposed routes. The receptors marked with asterisks are located near areas where any local air quality impacts would be expected to occur. In all cases the difference in air quality impact between the build and no-build alternatives would be less than one ppm at curbside locations, therefore, the impacts would not be measurable in the interior of the facilities.

d. Air Quality Maintenance Plan Consistency

The proposed project is consistent with the 1979 Bay Area Air Quality Plan insofar as it would give priority to additional transit service and thus reduce overall emissions of air pollutants from motor vehicles. As a result the project is consistent with state and federal regulations regarding air quality planning.

Mitigation

If the project were constructed, the following mitigation measures will be implemented to minimize dust pollution from construction are:

- Water exposed surfaces that generate dust
- Restrict traffic on unpaved surfaces
- Use tarpaulins on loaded trucks to reduce the effects of wind during transport
- Minimize the period during which soils are exposed
- Sweep streets daily

Such mitigation measures could be expected to decrease windblown dust during construction by approximately 50%.

Construction has the potential to increase traffic congestion, thereby increasing pollution (especially local concentrations of carbon monoxide). The adverse impact of such

TABLE 13

PREDICTED CHANGE IN REGIONAL VEHICLE MILES TRAVELED IN 1985[1]

	Decrease in VMT (millions)	% of Total Regional VMT
San Jose Avenue	3,500	0.004%
Monterey/Phelan	2,800	0.003%
Mission/Ocean	3,100	0.004%

[1] Sufficient data upon which to base a definitive estimate of the proportion of new Muni trips which would replace automobile trips is not available. The estimate used in the table is based, in part, upon data contained in Wilber Smith and Associates, Muni On-Board Summary of Results, San Francisco, California, April 1976. The report states that 67.6% of San Francisco residents using Muni do not own an auto. It was therefore assumed, in the absence of definitive data, that 75% of new Muni trips would be trips either previously not taken or trips previously not taken by automobile. Average length of displaced auto trips was assumed to be five miles.

TABLE 14
SENSITIVE AIR QUALITY RECEPTORS

San Jose Avenue Alternative	
Health Conservation, Inc. S.F. Home Health, Inc. Latin American National Senior Citizens International Geneva Association	225 30th St., near Church St.
Community Assembly of God	1819 San Jose Ave., near Santa Rosa
George Washington Masonic Temple	San Jose Ave. and San Juan
Balboa Park	San Jose Ave. between Ocean Ave. and Havelock St.
Monterey Boulevard Alignment	
Health Conservation, Inc. S.F. Home Health, Inc. Latin American National Senior Citizens International Geneva Association	225 30th St., near Church St.
Community Assembly of God	1814 San Jose Ave., near Santa Rosa
George Washington Masonic Temple	San Jose Ave. and San Juan
Lick Wilmerding High School	755 Ocean Avenue
City College of S.F. Riordan High School Campus Nursery School and Kindergarten	Phelan Avenue at Ocean to Judson St.
Balboa Park	San Jose Ave. between Ocean Ave. and Havelock St.
Mission Street Alternative	
Health Conservation, Inc. S.F. Home Health, Inc. Latin American National Senior Citizens International Geneva Assoc.	225 30th St. near Church St.
Free Methodist Church	Mission St. near Richland
4080 Mission St. YMCA	Mission St. near Bosworth
S.F. Jewish Home for Aged	Mission St. at Avalon & Silver
Church	Mission St. near Ocean
Balboa High School	Ocean Ave. and Cayuga
Balboa Park	San Jose Ave. between Ocean Ave. and Havelock St.

congestion will be mitigated by limiting interference with the flow of vehicles and pedestrians and providing traffic control measures where interference proved necessary. (Specific mitigation measures are contained in the transportation section of this report.)

2. Noise and Vibration

a. Noise and Vibration Characteristics of the Light Rail System

The Light Rail Vehicle (LRV) system presently used by Muni is the latest in the evolution of rail transit systems. The Muni Metro system includes continuous welded rail to eliminate the "clickety clack" noise characteristic of traditional railroad systems; the use of resilient wheels to reduce the "wheel squeal" as the vehicles turn corners and essentially eliminate squeal on straight track; resilient chassis mountings to reduce the amount of vibration transmitted into the soil below the track; use of low-noise, non-skid braking systems to reduce the noise generated during braking; and the use of wheel and rail grinders for maintaining the wheel and rails in a smooth condition. Nevertheless, the community has expressed concern about the possibility of noise and vibration from the project.

To determine typical noise and vibration levels emitted by LRVs, noise and vibration measurements were made along the existing L line near the corner of 46th Avenue and Vicente Street. At this location, one direction of the L Line turns the corner from 46th Avenue onto Vicente Street and in the other direction the vehicles travel straight down 46th Avenue. This enabled the noise of vehicles to be measured both turning a corner and traveling straight. Both single and multiple car trains were measured. The average speed of the trains was 20 to 25 mph. At this location, the rigid track is mounted on a slab foundation covered with asphalt, typical of the condition along the proposed connection where homes and businesses would be located closest to the tracks. A portion of the system (through the Bernal Cut on the San Jose Avenue alignment) would be on tie and ballast. The noise measurements were not made of the tie and ballast condition for two reasons: 1) previously published information indicates that airborne noise levels are the same or lower for this condition and 2) ground vibration is less.

Table 15, page 116 summarizes the noise emitted by the LRVs. The levels are referenced to a distance of 33 feet from the track, typical of the setback of the nearest homes or business along the proposed J Line Connection. It can be seen from the table that there is

some variation in the noise emitted by the vehicles. This variation is due primarily to the condition of the vehicle itself. There was no difference that could be attributed to the number of cars making up a train. The two loudest vehicles had wheels that were slightly out of round and emitted more noise than the wheels of other vehicles. It can also be seen that vehicles making a turn are actually quieter than vehicles traveling straight. This is primarily due to the fact that the trains slow to less than 15 miles an hour when rounding a curve. Some "wheel squeal" was noted when the LRVs turned the corner, but this noise was at a lower level than the motor and wheel/rail intersection noise level. By way of comparison, the sound levels of the LRVs are considerably lower than those emitted by a typical Muni bus. The maximum noise level at a similar distance for a Muni diesel bus range from 78 to 85 dBA. On the other hand, typical automobile noise levels at the same distance range from approximately 65 to 70 dBA. Diesel trucks emit maximum noise levels at this distance of approximately 80 to 85 dBA.

TABLE 15

MAXIMUM NOISE LEVELS OF LIGHT RAIL VEHICLES
AT A DISTANCE OF 33 FEET FROM THE TRACK OUTDOORS

(measured in dBAs)

Vehicles Traveling Straight	Vehicles Turning a Corner*
70	69
71	74
72	69
76	66
73	71
71	
75	

* Includes wheel squeal.

For the purposes of noise impact analysis, a typical noise level for an LRV traveling straight of 73 dBA at a distance of 33 feet will be used and a level of 70 dBA for a vehicle making a turn will be used.

No measurements were made of trains crossing a switch (turnout) or a crossover. A review of the literature indicates that noise levels are elevated when a train crosses a switch or a crossover by as much as 10 to 15 dBA.[15] It is anticipated that the only new crossovers or switches that would be added would be in front of the Muni Metro center, on Ocean Avenue, and in the Bernal Cut on the San Jose Avenue Alignment.

To assess the magnitude of vibration created by LRV passbys, vibration measurements were measured in a home on 46th Avenue. The average speed of the LRVs was 20 to 25 mph. The home is a typical San Francisco row house and is located approximately 33 feet from the near track which is similar to the setbacks of homes along the alternative alignments. Vibration levels a few feet nearer to or farther from the tracks would not be noticeably different. The measurements were made on the floor of the second story of this building. The vibration levels measured ranged from imperceptible to barely perceptible. No rattling of plates, dishes or picture frames was noticed during LRV passbys. Conversations with people living on this block indicated that the vibration levels of LRVs are significantly less than the old street cars. Vibration levels were measured outside, but are not reported here since personal indoor comfort is the most important issue. As each individual house has its own noise-reducing characteristics, indoor levels will vary slightly but the difference between pre-project and post-project will be the same both inside and outside.

The noise levels shown Table 15, page 116, do not include the noise created by the occasional, random release of excess air pressure from the braking system. This excess air is released through a nozzle under the vehicle and noise levels of up to 90 dBA were measured during this occurrence. These noise levels are high and because of their random nature are startling to persons standing on the street.

b. Impact Assessment

To evaluate the potential for noise impact along the proposed J Line Connection alignments, the maximum noise levels expected during an LRV passby were compared with existing maximum levels along the proposed routes. The equivalent hourly noise levels expected during LRV operation were compared with existing equivalent hourly noise levels, and the change in the day-night noise level (Ldn) along the alternative routes was evaluated. The potential for impact is based on the following acoustical criterion, commonly termed an "increase in the ambient" criterion. An increase of at least three

dBA is required before a change in environmental noise is noticeable. An increase of at least five decibels is required before any change in community response would be expected. If noise levels increase by ten dBA, adverse community response could almost certainly be expected. Therefore, an increase of less than five dBA in ambient noise levels is considered to be the "no impact" category, an increase of five to ten dBA is considered "some impact" and an increase of greater than ten dBA is considered a "significant impact."[16]

Muni estimates that approximately 377 trips daily would be made on the proposed J Line Connection. Table 1, Appendix A, page A-5, shows how these trips would be distributed over a typical day. Note that there are no anticipated operations between 2:00 AM and 4:00 AM. Also shown in Appendix A, Table 2, page A-6 is the anticipated hourly equivalent noise level (Leq) expected at a distance of 33 feet from the tracks due to LRV operations only. Noise levels at this distance represent the noise exposure of the closest residence or business along any of the alternative alignments. Many of the residences and businesses are farther than 33 feet from any proposed alignment. The total (including the existing noise) expected hourly Leq's and the anticipated 24-hour day-night noise level (Ldn) at each of the noise measurement sites (see Table 5, page 52) have been calculated. These sites represent the distance of typical receptors in the vicinity of the sites to the proposed alternative J Line connection alignments.

Calculations indicate that the greatest increase in hourly Leq at any location along any of the alternative routes would occur between 5:00 a.m. and 6:00 a.m. Table 2, Appendix A, page A-6 shows the existing hourly Leq from 5:00 a.m. to 6:00 a.m., the expected increase in the Leq between 5:00 a.m. and 6:00 a.m. and the increase in Ldn at each of the measurement locations if the J Line Connection passed by the sites. The largest increase in hourly Leq would be 4 dBA at site 1. This would be a "just noticeable" increase in noise level but would be categorized based on the increase in the ambient criteria as no impact. The largest increase in Ldn would occur at sites 1 and 5. This increase would be approximately 1 dB and would again be described as no impact. Based on the noise measurement survey results and the measurements of the noise emission of the LRVs, maximum noise levels along any of the routes would continue to be caused by diesel trucks, diesel buses, motorcycles, and loud cars. At a distance of 33 feet from the LRV tracks (representative of the closest home), maximum noise levels generated by diesel trucks, diesel buses, and loud cars range from 75 to 86 dBA, while the maximum noise levels

of the LRVs will range from 70 to 76 dBA. In summary, although the LRVs would be new noise sources in the area, they would not be louder than the buses, trucks, motorcycles and loud cars already using the streets and the number of LRVs added during any hour would not sigificantly increase the average noise level at any location. Based on this analysis, it can be concluded that the noise environment at any of the sites would not be significantly different as result of the J line Connection that it is at present.

The criteria used to assess vibration impacts are described in a document entitled, "Guidelines for Preparing Environmental Impact Statements on Noise," prepared by the Committee on Hearing, Bioacoustics and Biomechanics (CHABA), Assembly of Behavioral and Social Sciences, National Research Council.[17] The level of acceptable vibration is not dependent on source type. These criteria have been used to evaluate transit vibration impacts on projects throughout the United States. Based on the limited amount of data obtained for this report, indications are that vibration levels in homes and businesses along the proposed alignments would be barely perceptible and would be expected to generate no adverse community impact.

The above worst-case analysis assumes that no currently operating Muni buses would be removed from revenue service after the introduction of LRV revenue service. There is a strong possibility that all 26-motor coach operations on San Jose Avenue between Bosworth Street and Ocean Avenue would be eliminated if the San Jose Avenue Alignment alternative were to be selected. If this were to be the case, the overall noise environment along the affected portion of San Jose Avenue would experience a net improvement, although this improvement would be, at best, just noticeable. Between the critical hours of 5:00 to 6:00 a.m. five 26-motor coaches currently travel this segment of San Jose Avenue; during this same period, 14 LRVs would traverse this section. Five buses generate as much noise as approximately 25 LRVs. Thus, there would be a reduction in the overall level of noise of approximately three dBA, which is just noticeable. Of equal or greater importance, however, the number of events generating noise above 78 dBA would be reduced; the subjective perception of the noise for the heavier LRV traffic would not be as pronounced as that for the fewer motor coaches. This net improvement of the overall noise environment would not be limited to the early morning hours, but would extend throughout the day, since speed would be the same throughout the day.

The reduction of LRV traffic on Ocean Avenue as a result of the rerouting of J- and N-line pull-outs and pull-ins would not cause a noticeable improvement of the overall noise environment in that area. The background noises in the area would effectively cover any consequential noise level reduction.

Mitigation

It is anticipated that some residents along the J line alignment may complain about perceptible vibration during train passbys. Vibration caused by LRV passbys has been mitigated successfully in Europe by the design of resiliently mounted track.[18,19,20] This technique differs from the traditional American technique of rigidly connecting the tracks to a concrete base. Rigid construction easily transmits vibration to adjacent buildings. A great variety of resilient track designs have been used throughout Europe. These designs basically fall into two categories, distinguished by the method used to support the rails: ballast-based track and slab-based track. In those areas along the J Line Connection where the residences would be closest to the track, the track would share the right-of-way with other surface traffic; therefore it is anticipated that a slab base would be used. In this case, the rails can be isolated from the slabs by supporting them with a mastic asphalt cushion (one to two inches thick) poured beneath the rails after they have been set to alignment and level. This mastic is also used to isolate the track from the adjacent pavement. A 5 to 15 dB reduction in vibration levels could be expected depending on treatment.[19] In practical terms, resulting vibrations would be similar to those of other surface traffic (i.e., cars, trucks, buses). The use of mastic and/or of other methods would be relatively expensive. Although vibration levels are not expected to be significant, detailed engineering analysis will be done if the project is to be built, and if this is shown to be a serious problem, methods will be implemented to reduce the vibration levels below background levels.

3. Vegetation

The proposed LRV route for the Dolores Street subalternative to the San Jose Avenue alignment would not affect any palm trees lining Dolores Street, since only the southbound track would use Dolores Street, and an LRV turning on the Dolores/30th Street intersection would not come into contact with any portion of the palm-lined median strip.

A large (approximately 60 feet tall) Monterey cypress near San Jose Avenue and Havelock Street may require trimming to accommodate the overhead wires necessary to power the LRVs. Branches from this large tree extend out over the road pavement; trimming of

such overhanging branches is a normal practice and would not be expected to harm the tree.[21]

4. Energy

The energy impacts of the proposed project would be due to the energy costs of construction and operation (see Section IV.E.6, page 132) of the proposed project and to the influence of the new transit facilities on the energy consumption patterns of existing modes of transportation.

The proposed project would cause energy to be consumed by LRVs operating on the new route. It would result in energy savings by reducing:

- the amount of LRV operation required to place cars in and out of service
- the operation time of the Number 26 bus
- the number of passenger car miles driven for trips that would be taken on the new J line

Based upon collected data[22] it is possible to estimate the net change in the amount of energy that would be used by the entire system due to the proposed project as compared with current energy consumption. The results of these calculations are presented in Table 16, page 122.

The total connected load of the system (maximum average power) for any of the alignments would be approximately 2,700 kw. The actual load would vary in proportion to the number of cars operating on the route. It can be seen from Table 16, page 122 that the most energy costly alternative would be the Monterey Boulevard Alignment, followed by the Mission Street Alignment, followed by the No-Build Alternative. The San Jose Avenue Alignment would be the least energy costly of all, representing an energy savings of 2.9 billion BTUs annually above the No-Build Alternative. An engineering study has established that there is sufficient power and capacity in the distribution system to provide for electricity for each of the project alternatives.[23]

The energy costs of the build alternatives are presented in terms of the quantity of fossil fuels which must be consumed under ordinary conditions in order to provide the required

TABLE 16

ESTIMATED ENERGY CONSUMPTION
UNDER THREE ALTERNATIVE J LINE ROUTES[1]
(Millions of BTUs)

	San Jose Ave.	Monterey Blvd. Alignment	Mission Street Alignment
Increased Energy Cost for LRV Operations	28,000	36,000	27,500
In/Out of Service Operations Savings	(13,900)	(9,000)	(4,000)
Fuel Savings From Auto Trips	(7,000)	(6,000)	(7,000)
Fuel Savings From Reduced Operation of Muni Buses	(10,000)	(10,000)	(10,000)
Total Energy Cost	(2,900)	11,000	6,500

[1]The No-Build case is the baseline from which costs and savings in the task are calculated.

Calculations are based on the following assumptions:

- 11 hours of weekday operation at 6-minute headways
- 5 hours of weekday operation at 10-minute headways
- 3 hours of weekday operation at 20-minute headways
- 19 hours of weekend operation at 15-minute headways

Assumes each kwh consumed by the vehicle required 10,239 BTU of energy at the source. This results from the assumption that the power otherwise would be sold and used in place of fossil fuel elsewhere.

Overall energy costs include J line operation, reduction in in/out of service operation, reduced operation of Muni buses, and a reduction in the number of vehicle miles traveled due to increased Muni patronage.

Assumes one-car trains.

Assumes constant mode split.

power to the LRVs. Since the electricity is actually generated from hydroelectric sources this approach to calculating energy costs assumes that the hydroelectric power which would be used by the proposed project would have otherwise been sold, thus replacing fossil fuel use at another location.

A potential benefit is that a portion of Muni's energy consumption would be transferred from diesel fuel to electricity. This would help insulate Muni from potential problems with increased cost or limited supply of diesel fuel.

Mitigation

The energy costs of operating of the J Line may be reduced by:

- increasing headways during off-peak hours
- stopping the J Line at 30th Street and turning every other car back towards downtown during off-peak hours
- omitting the loop at the Metro center terminus from the transit routes

The first two measures would reduce overall energy consumption during off-peak hours because LRV transit is relatively energy-intensive compared to automobile travel when LRV occupancy is low. When the energy consumption of an LRV (about 11 kwh per mile) is compared with that of a passenger car (20 miles per gallon with an average occupancy of 1.2 persons per car) it is found that the LRV is more energy efficient then passenger car travel when average occupancy per car is greater than 22 people. This figure is based upon a comparison of the number of BTUs of fosil fuel required to generate the electricity to run the LRV car with the BTU content of the gasoline required to run the passenger car.

Measures which reduce service could cause potential riders to use other modes of transportation. However, it is unlikely that this effect would cause an overall increase in the energy consumed for these trips.

If the project were to be built, these operational measures will be considered by Muni to achieve an acceptable balance between transit service goals and energy conservation.

5. Geology and Seismicity

a. San Jose Avenue Alignment

Seismically, the alignment is relatively stable. Estimates of "strong" intensity for future groundshaking are based on a seismic event similar to that of the 1906 San Franciso earthquake.[24]

For planning purposes, it is reasonable to assume a 59- to 105-year return period for this type of earthquake.[25] Such an event could cause strong groundshaking due to wave amplifications in the soft, unconsolidated materials (slope debris and ravine fill) along the alignment. Densification of sand and subsequent differential settlement of supported structures could cause sagging or warping of the proposed track and temporary interruption of service.

Strong groundshaking could cause cracking of the Stanford Heights Reservoir. In the event of failure, water from the reservoir would inundate part of the roads beneath the Highway I-280 bridge/interchange at Monterey Boulevard, including a section of San Jose Avenue[26] (Figure 10, page 57). Determination of flow depth would require such information as stability analyses of reservoir embankments, vibration analyses of elevated tanks and an extensive field investigation of the inundation area. There is enough water in the 11 million gallon reservoir to cover the entire inundation area to a depth of approximately three inches.

Earthquake-induced landsliding could affect portions of the proposed alignment, particularly along San Jose Avenue between Monterey Boulevard and 30th Street. The alignment would be in areas of stable to generally stable slopes[27] where grades are between 0 and 15% (approximately 3.7:1) and are not underlain by landslide deposits. Most slopes above the proposed alignment have been planted and maintained with dense resident vegetation which would retard soil creep but not necessarily prevent active sliding.[28] Disruption of transit service would result from material sliding on to the right-of-way rather than sliding from under the right-of-way.

b. Monterey Boulevard Alignment

Seismically, the Monterey Boulevard Alignment would be less stable than the San Jose Avenue Alignment and more stable than the Mission Street Alignment.[29] Differential

settlement and landsliding would be hazards in the "very strong" groundshaking zone and on the steep slopes along Monterey Boulevard. Landsliding could affect portions of the alignment along Monterey Boulevard west of San Jose Avenue. Several landslides have occurred on the hillsides above and below Monterey Boulevard.[29] Slopes in this area are greater than 15% and are considered generally stable to marginally stable where not underlain by landslide.[30] Differential settlement could cause sagging or warping of the proposed track. Landsliding could cause material to fall on to the right-of-way, blocking the proposed tracks, or to slide from beneath the right-of-way, causing sagging of the proposed track. In each of these cases service would be interrupted until repairs could be completed.

The potential area of earthquake-induced flooding is the same area involved on the San Jose Avenue alignment.

c. Mission Street Alignment

Seismically, the Mission Street Alignment would be less stable than the San Jose Avenue Alignment during a great earthquake.[29] Differential settlement would be a greater hazard in the "very strong" groundshaking zone which is wider and steeper along the Mission Street Alignment. The effects of differential settling would be of similar type but of greater magnitude than those described for the San Jose Avenue Alignment. They would also be more likely to occur due to the higher intensity of groundshaking.

Because the alignment is elevated where it crosses I-280 it would be in no danger of flooding in the event of failure of the Stanford Heights Reservoir.

Earthquake-induced landsliding could affect portions of Mission Street between 30th Street and Monterey Boulevard. The alignment would be in a landslide-stability area similar to those along San Jose Avenue and would be subject to similar landsliding hazards.[30]

d. No-Build Alternative

Under the No-Build Alternative the J Line Connection would not be built. The existing soils, topographic and seismic conditions described in the setting sections for each of the three possible alignments would remain unchanged. No change in susceptibility to landsliding, seismic groundshaking or inundation by reservoir failure would occur.

Mitigation

Inundation caused by earthquake-induced failure of the Stanford Heights Reservoir is unlikely. Present review requirements relating to reservoir safety provide an adequate safety factor[31] but if the project were built and should any signs of structural weakness appear, Muni officials would be alerted through the Emergency Plan for the City so that precautions could be taken. This plan is administered through the Mayor's Office of Emergency Services which maintains an electronic "beeper" network with the heads of all City departments.

6. Hydrology

a. San Jose Avenue Alignment

Storm water would continue to be carried from the completed J Line Connection by the City storm drains, but no increase in runoff volume would be expected since the proposed alignment is already nearly impervious. There also would be no reduction in the volume of urban pollutants entering the City system.

b. Monterey Boulevard Alignment

Hydrologic impacts would include those described for the San Jose Avenue Alignment. Because they are steeper, slopes along the Monterey Boulevard Alignment would be subject to more severe erosion hazards than those along the San Jose Avenue Alignment. Sedimentation in the City storm drain system would be a greater problem if steep-slope erosion were allowed to occur.

c. Mission Street Alignment

The hydrologic impacts would be the same as those along the San Jose Avenue Alignment.

d. No-Build Alternative

Under the No-Build Alternative the existing hydrologic conditions along the three possible alignments would remain unchanged. No alteration would occur in the existing drainage and infiltration patterns.

Mitigation

Constructing during the dry season would reduce the potential for erosion of excavations and consequent siltation of the City storm drain system. Properly installed and maintained straw bales around inlets would further reduce siltation problems.

If the excavations or leveled areas are opened during the winter rainy period, the exposed surfaces will be diked to prevent soil erosion and consequent storm drain siltation.

E. CONSTRUCTION IMPACTS

1. Land Use and Urban Design

a. Conformance with Existing Land Use

During construction activity of segments of the proposed project, access to the adjoining properties could be hampered by the presence of construction equipment and materials.

Mitigation

During construction of the proposed project, pedestrian and vehicular access to adjoining properties will be maintained as much as possible. Construction activity will be scheduled to conform to a plan for maintenance of pedestrian and vehicular traffic which would be agreeable to the Department of Public Works. Expeditious construction methods will be used to reduce the time during which residents, motorists and adjoining land uses would be exposed to the additional noise and dust expected from the project.

2. Economic and Fiscal

a. Capital Costs of Construction

The capital costs of construction include embedded and at-grade track, street work, overhead wires and feeders, stations, structures, retaining walls, special track work, and utilities. The values used in the calculation of construction costs are conservative but do not include a number of items such as traffic relocation during construction, fencing, signing, and so on. For this reason, using professional judgment, a contingency item of about 20% has been added to each estimate to account for these additional costs.

Mitigation measures (i.e., grade separation on San Jose Avenue and Randall Street) considered and discarded due to excessive cost are not included in the costs of construction. Resilient track is under investigation, but to date has not been included in the costs of construction.

San Jose Avenue Alignment. Estimated construction capital costs are presented in Table 9, page 73. A contingency is added to the total, primarily for the San Jose Avenue

segment from 30th Street to Tingley Street, where the work will require street restoration to San Jose Avenue and the traffic problems involved with this high-volume street. Also, the I-280 undercrossing may require extra work. Total construction capital costs are estimated to be $10,900,000.

Monterey Boulevard Alignment. Construction capital costs for this alternative are similar to the San Jose Avenue alternative due to a segment of common route. A contingency is added to the total, primarily for the segment from 30th Street to Monterey Boulevard, where the work will require street restoration for San Jose Avenue. The southerly segment appears to be fairly straightforward track in pavement construction. Total costs are thus estimated to be $17,400,000.

Mission Street Alignment. This route appears to be fairly straightforward track in pavement construction and the total construction capital cost is estimate to be $14,300,000.

3. Public Services and Utilities

a. Fire

During construction the fire department must be able to maintain access to buildings on either side of the alignment construction zone.

b. Emergency Vehicles

Emergency response time could be affected by construction activity along all the build alternatives. The police department would be made aware of any temporary detour established during construction.

c. Communications

Buried telephone conduit crosses Monterey Boulevard at Circular Avenue. The conduit extends down both sides of Monterey Boulevard. The trenching proposed for LRV tracks would cross conduit at two points along Monterey Boulevard at Gennessee Street.

d. Water

Major water distribution lines are generally not located in the middle of the street and therefore would probably not be affected by the construction. However, the water

department standards require a two-foot cover on water mains; therefore, all water lines traversing the selected alignment would potentially be impacted. Trenches should be hand dug at points near mains to find the depth. Relocation costs would be borne by Muni.[32]

e. Sewer/Storm Water Drainage

During construction, sediments may be carried into the storm sewers increasing the potential for siltation. Runoff could be diverterd from storm drains into holding ponds in areas of construction activity. Catch basins and inlets would require relocation along various portions of the three alignments. The cost of relocating these facilities would be borne by Muni.

f. Solid Waste

Salvaged existing castings and stone curbs would be sent to the City Corporation yards. The garbage collection company anticipates no difficulty in providing collection services either to the San Jose Avenue or Monterey Boulevard Alignments. However, collection vehicle access along the commercial areas of Mission Street may be affected during construction of the Mission Street Alignment.[33]

4. Air Quality

The construction of the J Line Connection would require laying tracks, constructing overhead power lines and modifying of existing streets to provide for LRV turns and car stops. During the construction of any of the alignments, pollutant levels would be affected by construction activities. Specifically, windblown dust could, if uncontrolled, be carried into nearby residential areas. This is not likely to present a health hazard but could be a nuisance due to increased dustfall and soiling.

Mitigation

If the project were built, examples of mitigation measures that will be taken to minimize dust pollution due to construction are:

- Watering on exposed surfaces that generate dust
- Restriction of traffic on unpaved surfaces

- Use of tarpaulins on loaded trucks to reduce the effects of wind during transport
- Minimization of the period during which soils are exposed

Such mitigation measures could expect to decrease windblown dust during construction by approximately 50%.

Construction has the potential to increase traffic congestion, thereby increasing pollution (especially local concentrations of carbon monoxide). The adverse impact of such congestion will be mitigated by limiting interference with the flow of vehicles and pedestrians and providing traffic control measures where interference proved necessary. These measures will in turn temporarily reduce pedestrian access to the immediate area of construction.

5. Noise

The project designers anticipate that construction would be done one block at a time except through the Bernal Cut where the entire segment could be done as one piece. The process would consist of removing the existing pavement, preparation of the track bed, installation of the ties and ballast, installation of the rails, and reconstruction of the roadway surfaces. From start to finish, construction would require approximately three weeks per block. The project proponent anticipates that there may be situations in the vicinity of major intersections (for example, San Jose Avenue at 30th Street) where the City may require construction to take place on weekends or at night.

Construction noise in San Francisco is regulated by City Ordinance No. 274-72, Regulation of Noise. The Noise Ordinance requires that all powered construction equipment (except impact tools and equipment) not emit more than 80 dBA when measured at a distance of 100 feet or 86 dBA measured at a distance of 50 feet. Impact tools and equipment including pavement breakers, jackhammers and pile drivers must have both their intake and exhaust muffled to the satisfaction of the Director of Public Works. The Ordinance further requires a special permit for construction after 8:00 p.m. and before 7:00 a.m. All equipment used on the job must meet the requirements of the Noise Ordinance.

Table 17, page 131, shows the typical equipment and associated noise emission levels that would be used during the construction process:

TABLE 17

CONSTRUCTION EQUIPMENT NOISE LEVELS

Anticipated Construction Equipment	Typical Noise Level at 50 Feet
Drop hammer	85-95 dBA
Spike driver	85-95 dBA
Truck-mounted diesel ballast tamper	75-85 dBA
Trucks	75-85 dBA
Front end loader	75-85 dBA
Paving machine	75-85 dBA
Crane	70-80 dbA

During the approximate three to five weeks that it would take to complete a section of track, maximum noise would be generated during pavement removal and spike driving. It is estimated that the time required to remove the pavement would be approximately one to two days and that spike driving could be done in one to two days. During the remainder of the time, the major noise sources would be trucks, front end loaders, hand tools, etc. In general, construction noise during this time would not exceed existing truck and bus noise in the area. During the use of the spike driver and drop hammer, noise levels would be 10-15 dBA higher than typical and could result in noise levels inside the nearest homes of up to 85 dBA with the windows open. With the windows closed in the nearest homes, noise levels could reach 80 dBA. This is a level at which annoyance could be anticipated, interference with listening to television or radio would be expected, interference with sleep would be expected, and complaints would be anticipated. This activity would be expected to represent several days at the most for each house. If these activities took place at night, sleep disturbance could be expected throughout the block.

Mitigation

To mitigate construction noise impacts if the project were built, the use of impact tools will be restricted to daylight hours in residential areas. In residential areas, construction hours will be restricted to the daytime. All equipment will be adequately muffled. The intake and exhaust of impact equipment will be equipped with mufflers. To minimize the psychological impact of construction noise, each block will be notified of the anticipated time and duration of construction.

6. Energy

One method of predicting energy use during construction is to total the energy costs of materials, equipment and raw materials transport. This method is impractical in the case of the proposed project due to the lack of detailed construction plans and schedules. A less precise, but more practical method is to use figures developed for estimating the energy costs of other light rail transit construction based on total estimated construction cost. According to this procedure construction costs would be as presented in Table 18, page 133.

7. Geology

a. San Jose Avenue Alignment

Construction within the Colma Formation may cause settlement near the edges of excavations. The sand is less firm and less coherent "at depth, where the material is fresh," than it is at the surface, where weathering has improved its stability.[34] Although its slope stability is fair to good,[35] freerunning sand conditions make shoring a necessity in cuts through fresh material. Similar or more serious conditions occur within articial fill which underlies part of I-280 bridge/interchange complex. The potential for damage during settlement would be highest along those segments of the San Jose Avenue alignment beneath the bridge/interchange where grading may be required.

TABLE 18

CONSTRUCTION ENERGY COSTS OF J LINE BUILD ALTERNATIVES

Alignment	Energy Cost[1]	
	Billions of BTU[2]	Equivalent in Barrels of Oil[3]
San Jose Avenue	570	103,000
Monterey Boulevard	900	162,000
Mission Street	740	133,000

[1]These energy costs are based on a rate of .52 x 10^5 BTU per 1981 dollar. Apostolos J.A. et al. Energy and Transportation Systems, California Department of Transportation, Sacramento, California December 1978.

[2]BTU (British Thermal Unit): A standard unit for measuring heat equal to that from burning one standard wooden kitchen match. Technically, it is the quantity of heat required to raise the temperature of one pound of water 1° Fahrenheit (251.98 calories) at sea level.

[3]One barrel of oil is equivalent to approximately 5.6 million BTUs.

b. Monterey Boulevard Alignment

Construction in the Colma Formation, ravine debris and artificial fill along this alignment would be under conditions similar to those along San Jose Avenue with two exceptions: more bedrock would be encountered, and the steeper slopes would require more grading and shoring. The potential for settlement damage would be highest in the area of pre-existing artificial fill where the Monterey Boulevard Alignment departs from the San Jose Avenue Alignment through the I-280 bridge/interchange.

c. Mission Street Alignment

Construction within the Colma Formation and artificial fill along the Mission Street Alignment would be subject to impacts similar to those described for the San Jose Avenue Alignment. The potential for damage during settlement would be highest on either end of the bridge over I-280 where artificial fill underlies the alignment.

Mitigation

A geotechnical study of the selected alignment will be necessary to identify any localized geologic hazards which might affect the rail bed if the project were to be built. Foundation studies will be carried out, and their recommendations followed, where grade modifications are proposed, particularly in the filled areas to be altered under the I-280 bridge/interchange complex. The construction and installation of the proposed tracks will be performed under the supervision of a qualified civil engineer; all appropriate engineering design requirements will be met, thus reducing the potential for slumping or settlement. Earthquake-induced settlement within loose artificial fill or native sand will be reduced or eliminated by 95% compaction of backfill prior to repaving or laying of track.

Strict attention to replanting slopes disturbed during grading operations will be done to retard soil loss and give limited stability for earthquake-induced landsliding. An inspection will be done by a geotechnical engineer of existing slide areas to assess the need for restabilizing any recent landslides along the proposed alignment.

Although it is not certain that future landsliding would occur along this section of the proposed San Jose Avenue Alignment, such precautions are considered reasonable to minimize danger within landslide hazard zones.

8. Hydrology

An interim pollution source could result from leveling of a 50 foot x 100 foot area for construction of a transformer station if it occured during the rainy season; sediment could be eroded from exposed surfaces and washed into the drainage system. Fine particles and organic material are the main soil constituents which would be removed. These could increase siltation within the storm drains and at the entry and discharge points.

Grading beneath the I-280 bridge/interchange could alter runoff patterns in the immediate vicinity of the construction by deepening some cuts to allow shallower grades. No net increase in runoff is expected from these alterations.

Mitigation

Constructing during the dry season would reduce the potential for erosion of excavations and consequent siltation of the City storm drain system. Properly installed and maintained straw bales around inlets would further reduce siltation problems.

If the excavations or leveled areas were to be opened during the winter rainy period, the exposed surfaces should be diked to prevent soil erosion and consequent storm drain siltation.[36]

F. MITIGATION MEASURES THAT ARE INCLUDED IN THE PROJECT IF BUILT

1. Land Use and Urban Design

To reduce vertical cluttering, support standards for the overhead trolly wire will be combined, where possible, with street lamp and overhead utility standards. Street lighting will correspond to transit stop locations where possible.

2. Transportation

The addition of a left-turn green arrow for the westbound Randall Street approach to the San Jose Avenue-Randall Street intersection and shortening the eastbound Randall Street green phase will be done to improve the efficiency of the intersection and help minimize the queue on Mission Street.

Use of the Muni Fast Pass for intra-San Francisco BART trips is tentatively scheduled to begin in late 1982. When and if this occurs, BART will function as an integral part of the Muni system and the added cost of using both BART and Muni will no longer deter trip making. Both the 14X-Mission Express and the 14GL-Guerrero Limited peak-hour-only

routes that serve the Outer Mission, are scheduled to be discontinued when the Fast Pass is accepted by BART. The patronage impact for the proposed J Line Connection of Fast Pass acceptance on BART, would be expected to be great since BART already carries most of the downtown trips from the San Jose Avenue corridor.

3. Noise and Vibration

It is anticipated that some residents along the J Line alignment may complain about perceptible vibration during train passbys. Vibration caused by light rail vehicle passbys has been mitigated successfully in Europe by the design of resiliently mounted track.[37,38,39] This technique differs from the traditional American technique of rigidly connecting the tracks to a concrete base. Rigid construction easily transmits vibration to adjacent buildings. A great variety of resilient track designs have been used throughout Europe. These designs basically fall into two categories distinguished by the method used to support the rails: ballast-based track and slab-based track. In those areas along the J Line Connection where the residences would be closest to the track, the track would share the right-of-way with other surface traffic; therefore it is anticipated that a slab base would be used. In this case, the rails can be isolated from the slabs by supporting them with a mastic asphalt cushion one to two inches thick poured beneath the rails after they have been set to alignment and level. This mastic is also used to isolate the track from the adjacent pavement. A five to 15 dB reduction in vibration levels could be expected depending on treatment. The use of mastic or of these other methods would be expensive, relative to ordinary track costs. Although vibration levels are not expected to be significant, detailed engineering analysis will be completed and if this is shown to be a serious problem, methods will be implemented to reduce the vibration levels below background levels.

4. Energy

Energy costs of operating of the J Line will be reduced by:

- increasing headways
- omitting the loop at the Metro center terminus from the transit routes
- stopping selected cars on the M line at the State College stop, and turning them back toward downtown
- stopping selected cars on the J line at 30th Street and turning them back toward downtown

These operation measures will be considered by Muni to achieve an acceptable balance between transit service goals and energy conservation.

5. Construction Only

a. Mitigation of Impacts on Existing Land Uses

During construction of the proposed project, pedestrian and vehicular access to adjoining properties will be maintained as much as possible. Construction activity will be scheduled to minimize inconveniences and disruption for adjoining uses. Expeditious construction methods will be used to reduce the effects of noise and dirt on residents, motorists and adjoining land uses.

b. Public Services and Utilities

The Police and Fire Department, and ambulance service will be made aware of any temporary traffic detours established during construction.

During construction, trenching will be hand dug at points near water mains to find depth. Relocation costs will be borne by Muni.[40]

c. Air Quality

The following mitigation measures will be done to minimize dust pollution due to construction are:

- Water exposed surfaces that generate dust
- Restrict traffic on unpaved surfaces
- Use tarpaulins on loaded trucks to reduce the effects of wind during transport
- Minimize the period during which soils are exposed
- Sweep streets daily

Such mitigation measures could be expected to decrease windblown dust during construction by approximately 50%.

Construction has the potential to increase traffic congestion, thereby increasing pollution (especially local concentrations of carbon monoxide). The adverse impact of such congestion will be mitigated by limiting interference with the flow of vehicles and pedestrians and providing traffic control measures where interference proved necessary.

d. Noise

To mitigate construction noise impacts, the use of impact tools will be restricted to daylight hours in residential areas. In residential areas, construction hours will be restricted to the daytime. All equipment will be adequately muffled. The intake and exhaust of impact equipment will be equipped with mufflers. To minimize the psychological impact of construction noise, each block will be notified of the anticipated time and duration of construction.

e. Geology

A geotechnical study of the selected alignment will be done to identify any localized geologic hazards which might affect the rail bed. Foundation studies will be carried out, and their recommendations followed, where grade modifications are proposed, particularly in the filled areas to be altered under the I-280 bridge/interchange complex. The construction and installation of the proposed tracks will be performed under the supervision of a qualified civil engineer; all appropriate engineering design requirements would be met, thus reducing the potential for slumping or settlement.

Earthquake-induced settlement within loose artificial fill or native sand will be reduced or eliminated by 95% compaction of backfill prior to repaving or laying of track.

Strict attention to replanting slopes disturbed during grading operations will be done to retard soil loss and provide limited stability for earthquake-induced landsliding. An inspection by a geotechnical engineer of existing slide areas will be done to assess the need for restabilizing any recent landslides along the proposed alignment.

Although there can be no assurance that future landsliding would not occur along this section of the proposed San Jose Avenue alignment, such precautions are considered reasonable to minimize danger within landslide hazard zones.

f. Hydrology

Constructing during the dry season would reduce the potential for erosion of excavations and consequent siltation of the City storm drain system. Properly installed and maintained straw bales around inlets will further reduce siltation problems.

If the excavations or leveled areas are opened during the winter rainy period, the exposed surfaces will be diked to prevent soil erosion and consequent storm drain siltation.

G. UNAVOIDABLE ADVERSE IMPACTS

1. Short-term Impacts

a. Visual Effects and Urban Design
   - Disruption of visual setting by construction equipment and delivery vehicles.

b. Economic and Fiscal
   - City's outlay for construction and rolling stock would amount to at least $2.9 million (20% of total cost; least expensive alternative).
   - Construction activity, pedestrian barriers may temporarily affect adjacent businesses.

c. Public Services and Utilities
   - Emergency vehicle response time could be affected by the presence of the LRVs on narrow segments of the alignment.

d. Transportation
   - Temporary (approximately three weeks per block) traffic congestion and pedestrian inconvenience during construction.
   - Some street parking would be temporarily lost during construction.

e. Air Quality, Noise and Vibration
   - Construction dust, emissions from construction equipment; noise and vibrations from construction equipment.

f. Energy
   - Five hundred seventy billion to 780 billion BTUs (equivalent to 100,000-140,000 barrels of oil) would have to be expended during the construction phase.

2. Long-term Impacts

a. Visual Effects and Urban Design
   - Change of visual quality along routes from permanent support structures, views affected from street windows of second-story living spaces and from street level.

- Intrusion of LRVs in those areas and neighborhoods where previously absent.
- LRV lighting (internal and headlights) would contribute to background lighting, occasional bright white arcing would be noticeable.

b. Economic and Fiscal
- The operation of Monterey Boulevard and Mission Street Alignments would generate net yearly costs.
- Possible pressure for rezoning for higher usage density along all proposed alignments; probable consequential increase in land values and subsequent increase in lease and rental rates.
- Potential redirection of consumers away from neighborhood businesses to Stonestown, and downtown shopping areas resulting from greater accessibility.

c. Public Services and Utilities
- Permanent physical structures in City College loop section of the Monterey Boulevard Alignment would be only above-ground utilities in this area, except for Gennessee Street.

d. Transportation
- Increased interface between rail and non-rail vehicles would adversely affect traffic flow and occasionally reduce traffic speed.
- Parking spaces might have to be eliminated near many LRV car-stops.
- Derailed LRV at I-280 off-ramp (Monterey Boulevard Alignment) could create backup onto freeway, with potential for high-speed accident.

e. Vibration
- LRV traffic may cause barely perceptible to perceptible vibration in buildings adjoining right-of-way.

f. Energy
- The San Jose Avenue Alignment would have an annual savings of about 2.9 billion BTUs. The Monterey Boulevard Alignment would have an annual cost of 11 billion BTUs. The Mission Street Alignment would have an annual cost of 6.5 billion BTUs.

H. SHORT-TERM USES OF THE ENVIRONMENT VERSUS LONG-TERM PRODUCTIVITY

The construction phase of the J Line Connection would involve several short-term adverse impacts related to construction activity itself. Increased fuel consumption, noise levels, dust generation, disruption of pedestrian flow and rerouting of vehicular traffic would occur during construction of any proposed alternative on any alignment. Construction could temporarily disrupt individual businesses, particularly small shops whose sales rely on window displays and walk-in trade. Loss of short-term parking spaces would also affect residences and businesses in the project area. Short-term beneficial impacts would result from increased employment and from the purchase of construction materials.

In terms of maintenance and enhancement of long-term productivity, the J Line Connection represents a common situation found in transit projects. There could be long-term, broad-based benefits to Muni. Over the long run, marginal and indirect[41] benefits of improved air quality and of reduced noise could be realized as well as the additional impetus to transit use provided by transit system improvements. Negative impacts to the visual environment and from vibration would be noticeable initially; but over the long run such disturbances would be incorporated into the known and accepted character of the cityscape and of city life.

Since a well-functioning transit system serves as a cornerstone to any region's productivity, the long-term productivity of San Francisco would be maintained or enhanced by the project.

I. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

1. Money

The cost of construction, rolling stock and other capital items represents a resource commitment which cannot be directly recovered. These expenditures would be offset, however, by the consequential benefits to Muni, to transit users, and to the economy of the City and could be indirectly recovered through reduced operating costs. These expenditures would also create a short-term increase in business activity, employment and personal income.

2. Construction Materials

Materials necessary to complete of the construction phase of the J Line Connection would include concrete aggregate, cement, lumber, steel, other metals, and asphalt. Some of this material would be locally or regionally produced.

3. Rolling Stock and Other Capital Items

In light of current recycling efforts and technology, steel, other metals, wood, plastics and other oil-derived hydrocarbon products would be irreversibly and irretrievably committed by the manufacturing process.

4. Manpower

Labor expended on construction of the J Line Connection and for the manufacture of vehicles and other necessary items could not be recovered. However, benefits such as increased short-term employment and personal income, and long-term benefits derived by Muni and its ridership and by the City would be direct and indirect consequences of the labor invested in the project.

5. Energy

Construction of the J Line Connection and manufacture of vehicles and other necessary items would require electricity generated from various sources and fossil fuel energy to be consumed both inside and outside the region.

Operation of the J Line Connection would entail on-going expenditure of electric energy generated by the Hetch Hetchy Water and Power Department. This energy is generated by the effectively renewable resource of falling water (hydroelectric power).

---

[1] Bruce Bernhard, Finance Bureau, Public Utilities Commission, July 20, 1982. (Costs are in 1981 dollars).

[2] The engineering design life of the project would be 30 years, although the connection may actually function as long as 50 years. By discounting to present value, the analysis assumes that the total benefits accrued over the life of the project are worth less (due to the opportunity cost of money) than if the total amount were available today for other investment purposes.

[3]Joseph Sullivan, Chief, San Francisco Fire Department, Planning and Research Division, telephone conversation, November 24, 1981.

[4]James Farrell, Sergeant, San Francisco Police Department, Crime Analysis Division, telephone conversation, November 24, 1981.

[5]Tim Liliquist, Management Assistant, San Francisco Department of Parks and Recreation, telephone conversation, December 4, 1981.

[6]This section was prepared by consulting maps made available by Pacific Gas and Electric Company.

[7]Parsons, Brinckerhoff, Quade and Douglas, Inc. Report on Phase I: Municipal Railway J-Line Connection, 30th and Church Streets to Metro Center, prepared for the City and County of San Francisco, Public Utilities Commission, Utilities Engineering Bureau.

[8]This section was prepared by consulting conduit and aerial cable records made available by Pacific Telephone and Telegraph Company.

[9]John Perdomo, Design Engineer, Viacom Cablevision, personal communication, July 8, 1982.

[10]This section was prepared by consulting maps available at the Engineering Division of the San Francisco Water Department.

[11]Nathan Lee, Engineering Associate, San Francisco Clean Water Project, personal communication, December 7, 1981.

[12]San Francisco Department of Public Works, Mission District Traffic Study, July 1, 1977.

[13]Counts by Parsons, Brinckerhoff, Quade and Douglas, May 5, 1981 and April 8, 1981.

[14]Bay Area Air Pollution Control District, Guidelines for Air Quality Analysis of Projects, San Francisco, California 1975, updated 1981.

[15]Swing, Jack W. and Pies, Donald B. "Accessment of Noise Environment Around Railroad Operations." Wyle Laboratories Report WCR 73-5, July 1973.

[16]International Standards Organization (ISO) Recommendation R1996: "Assessment of Noise with Respect to Community Response," May 1971.

[17]Wilson, George Paul and Murray, Robert J., "Environmental Impact of Subway Rapid Transit Systems," Inter-Noise 74 Proceedings, Washington D.C., September 30 - October 2, 1974.

[18]Brown J.C., "A New Tramway Track Construction System," Modern Tramway, August, 1980.

[19]Fox, Gerald D., "The Design of Light-Rail Track in Pavement," Special Report 182, 1978.

[20]Knight, Kenneth G. and Wilson, George Paul, "Design and Performance of a Floating Slab Trackbed," Noise-Con 73 Proceedings, Washington D.C., October 15-17, 1973.

[21]Alves, Alan, City Gardener, San Francisco City College, conversation of July 9, 1982.

[22]Ross Maxwell, Project Engineer, Parsons, Brinckerhoff, Quade and Douglas, written communication, November, 1981.

[23]Parsons, Brinckerhoft, Quade and Douglas, Inc., Muni J-Line Connection Phase I, City and County of San Francisco, Public Utilities Commission, Utilities Engineer Bureau, San Francisco, California.

[24]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, page 14 and Figure 2.

[25]Shedlock, K. M., et al., Earthquake Recurrence in the San Francisco Bay Region, California, From Fault Slip and Seismic Moment, U.S. Geological Survey Open File Report 80-999, Menlo Park, California, 1980, page 10.

[26]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, pages 39-41 and Figure 9.

[27]Nilsen, T. H. et al., Relative Slope Stability and Land-Use Planning in the San Francisco Bay Region, California, U.S. Geological Survey Prof. Paper 944, Wash., DC, 1979, plate 3, scale 1:125,000.

[28]Site investigation by EIP Geologist, 23 April 1981.

[29]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, page 14 and Figure 3; page 17 and Figure 4.

[30]Nilsen, T.H. et al., Relative Slope Stability and Land-Use Planning in the San Francisco Bay Region, California, U.S. Geological Survey Prof. Paper 944, Wash., DC, 1979, plate 3, scale 1:125,000.

[31]URS/John A. Blume and Associates, Engineers, San Francisco Seismic Safety Investigation, San Francisco, June 1974, page 50 and Figure 4.

[32]James Cooney, Engineer, City Distribution Division, San Francisco Water Department, telephone conversation, December 11, 1981.

[33]Dino Queirolos, Vice President, Sunset Scavenger, telephone conversation, December 18, 1981.

[34]Bonilla, M. G., "Geologic Observations in the Epicentral Area of the San Francisco Earthquake of March 22, 1957," in San Francisco Earthquakes of March 1957, Cal. Div. Mines Geol. Spec. Rpt. 57, San Francisco, 1959, page 32.

[35]Schlocker, J., Geology of the San Francisco North Quadrangle, California, U.S. Geological Survey Professional Paper 782, Wash., DC, 1974, pages 96-97.

[36]ABAG, Erosion and Sedimentation Control Training Handbook, Berkeley, CA, July 1981, pages 6.2 - 6.5

[37]Brown J.C., "A New Tramway Track Construction System," Modern Tramway, August, 1980.

[38]Fox, Gerald D., "The Design of Light-Rail Track in Pavement," Special Report 18, 1978.

[39]Knight, Kenneth G. and Wilson, George Paul, "Design and Performance of a Floating Slab Trackbed," Noise-Con 73 Proceedings, Washington, D.C., October 15-17, 1973.

[40]James Cooney, Engineer, City Distribution Division, San Francisco Water Department, telephone conversation, December 11, 1981.

[41]These benefits are indirect because the proposals are intended primarily to relieve fiscal and operational problems, not, in the first order of priority, to reduce adverse environmental impacts along the proposed routes or in the City generally.

V. HISTORIC PROPERTIES AND PARKLANDS

A. APPLICABLE LAWS

Section 106 of the National Historic Preservation Act of 1966 requires that impacts from federally assisted projects be examined for effects on all historic and cultural resources listed or eligible for inclusion in the National Register of Historic Places.[1] Sites eligible for listing on the National Register must have significance in American history, architecture, archaeology and culture. Section 4(f) of the 1966 Department of Transportation Act also applies to historic properties, both publicly and privately owned, that are judged to be of national, state or local historic significance. Properties also protected by Section 4(f) of the DOT Act include public parks, recreation, lands, wildlife and waterfowl refuges.

B. SECTION 106 DETERMINATION

Selection and implementation of any of the four alternatives of the Muni J Line Connection would not affect sites listed in or eligible for the National Register. No state landmarks are located within the alternative alignments; however, a City Landmark lies within the study area boundaries along the Circular Avenue portion of the Monterey Boulevard Alignment. The Sunnyside Conservatory, built in 1917 by Frank Merrill, became a San Francisco designated landmark on December 7, 1975. Although in good condition in the mid-1970s, the wood-framed building at 236 Monterey Boulevard is now severely dilapidated.

The Department of City Planning conducted a survey of architecturally significant buildings in 1976. Several structures along each alignment have been rated (see Table 19, page 147).

Structures with a City Planning Rating of three or higher are considered to have architectural value. Falling within this category are two buildings: Balboa Park Station, adjacent to the Muni Car Barns, and Sunnyside Conservatory.

TABLE 19
ARCHITECTURALLY SIGNIFICANT BUILDINGS[1]

Building	DCP Rating
SAN JOSE ALIGNMENT	
San Jose Ave. and San Juan George Washington Masonic Lodge	0/1
Balboa Park Swimming Pool	2/2
Ingleside Police Station	0/0
San Jose Ave. and Ocean BART Station	2/3
MISSION STREET ALTERNATIVE	
College Terrace (22 homes)	1/2
4600 Mission St. Savings and Loan	2/2
Mission St. and Silver S.F. Jewish Home for the Aged	1/2
Balboa Park Swimming Pool	2/2
Ingleside Police Station	0/0
San Jose Ave. and Ocean BART Station	2/3
MONTEREY BOULEVARD ALIGNMENT	
All structures listed under the San Jose Ave. Alignment plus the following:	
230 Monterey Blvd. Home	2/2
234-6 Monterey Blvd. Sunnyside Conservatory	4/4
346 Hearst St. Homes	1/2
394 Hearst St.	0/0

[1] DCP Rating refers to an architectural survey of all buildings in the City, conducted by the Department of City Planning in 1976. Those buildings considered to have architectural value were rated as to the degree of architectural value from a low of "0" to a high of "5". Buildings rated 3, 4 or 5 represent less than one percent of the City's entire building stock. The survey rating is comprised of two numbers, i.e., 3/4. The first number reflects only the exterior architectural quality of the building; the second reflects both the architecture and the building as viewed in its setting.

At the request of Muni, the State Historic Preservation Office conducted a search of its cultural records and determined that no California Historical Landmarks, Points of Historical Interest, or sites included in or eligible for inclusion in the National Register of Historic Places are located within or adjacent to the study area.[2]

The alternative alignments would neither physically nor constructively take any land from a historic resource; therefore, no Section 4(f) involvement is foreseen.

The project area has been occupied since at least the Spanish era in California with the founding of the Mission San Francisco de Asis (Mission Dolores) in 1776.

Since the proposed J Line Connection would be constructed within existing street rights-of-way, the level of modification of undisturbed soil horizons during construction of the tracks is anticipated to be low, and no archaeological resources are expected to be unearthed. The Archaeological Regional Officer has been contacted to search existing records to determine if archaeological sites have been discovered within the area encompassing the three proposed alignments. The search indicated that there are no recorded sites within one-half mile of any of the alignments.[3]

Should any archaeological artifacts be discovered during project excavation, UMTA, the San Francisco Environmental Review Officer and the President of the San Francisco Landmarks Preservation Advisory Board would be notified. Excavation which might damage the discovered artifacts would be suspended for a maximum of four weeks to allow determination of the significance of the find by a historical archaeologist. Procedures required by the Archaeological and Historic Preservation Act (1974) would be followed.

C. SECTION 4(F) EVALUATION

The San Jose Avenue, Mission Street and Monterey Boulevard Alignments would neither physically nor constructively take any land from the park or any wildlife or waterfowl refuge. Therefore, no Section 4(f) involvement is foreseen in this area. The three alternative alignments would traverse Dolores at 30th Street. Although not used recreationally, the landscaped medians on Dolores Street are dedicated City parkland. Balboa Park, a 27.5-acre city park bisected by Interstate 280, is the only recreational area

adjacent to the alignments. Balboa Park at San Jose Avenue and Havelock Street is just north of the Muni Metro Center and therefore opposite the terminus for all three proposed alignments. The San Jose Avenue Alignment parallels the eastern boundary of the park. The park contains Ingleside Police Station, Balboa Swimming Pool, a soccer field complete with stands, press box and snack bar, four baseball diamonds, four tennis courts, a playground, bike racks and playing field. The park is characterized by mature cypress, bay, pine and eucalyptus trees. The park offices, gardening, equipment area and baseball dressing areas are attached to Ingleside Station. A parking lot which accommodates about 100 cars is adjacent the police station. Several smaller City parks and playgrounds are located in close proximity to the Muni J-Line study area and are depicted in Figure 4, page 22. The only impact associated with the project would be improved transit access to parks along the selected alternative route.

The San Jose Avenue, Mission Street and Monterey Boulevard Alignments would neither physically nor constructively take any land from the park or any wildlife or waterfowl refuge. Therefore, no Section 4(f) involvement is foreseen in this area.

---

[1]U.S. Department of the Interior, Federal Register, Annual Listing of Historic Properties, Part III, February 1980, Part II, February 1981; Part III, February 1982.

[2]Knox Mellon, State Historic Preservation Officer, Office of Historic Preservation, Department of Parks and Recreation, State of California, letter, August 11, 1980.

[3]Thelma McGregor, Regional Officer, California Archaeological Site Survey, letter, December 15, 1981.

VI. LIST OF RECIPIENTS OF EIS

FEDERAL AND STATE AGENCIES

State Office of Intergovernmental Management (10)
1400 - Tenth Street
Sacramento, California 95814

Air Quality Resources Board
Regional Programs Division
1102 Q Street
Sacramento, CA 95814

Department of Transportation
- Office of the Secretary
- Regional Representative of the Secretary
- Federal Highway Administration
- Department of Health and Human Services
- Department of Housing and Urban Development
- Department of the Interior
- Environmental Protection Agency

Air Resources Board
Department of Transportation (Caltrans)
Office of Historic Preservation
Office of Planning and Research
State Clearinghouse

REGIONAL AGENCIES

Association of Bay Area Governments
ABAG Clearinghouse
Bay Area Air Quality Management District
Metropolitan Transportation Commission (MTC)
MTC Clearinghouse
California Archaeological Site Inventory - Sonoma State

Association of Bay Area Governments
Hotel Claremont
Berkeley, California 94705

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109
Attn: Irwin Mussen

Bay Area Rapid Transit District
939 Ellis Street
Oakland, California 94705

California Archaeological Site Inventory
Department of Anthropology
Sonoma State University
Rohnert Park, CA 94928

Golden Gate Bridge Highway & Transportation District
P.O. Box 9000, Presidio Station
San Francisco, California

Alameda-Contra Costa Transit District
508 - 16th Street
Oakland, CA 94612

Metropolitan Transportation Commission
Hotel Claremont
Berkeley, California 94705

Caltrans
130 Oak Street
San Francisco, CA 94102

San Mateo County Transit District
400 South El Camino
San Mateo, California 94402

CITY AND COUNTY OF SAN FRANCISCO

San Francisco City Planning Commission
450 McAllister, 5th Floor
San Francisco, California 94102
Lee Woods, Commission Secretary
Toby Rosenblatt, President
Susan Bierman
Roger Boas
Norman Karasick, Alternate
Jerome Klein
Yoshio Nakashima
Richard Sklar
Eugene Kelleher, Alternate
C. Mackey Salazar

Landmarks Preservation Advisory Board
450 McAllister Street
San Francisco, CA 94102
Attn: Jonathan Malone, Secretary

Bureau of Building Inspection
450 McAllister Street
San Francisco, California 94102
Attn: Robert Levy, Superintendent

Water Department
Distribution Division
425 Mason Street
San Francisco, CA 94102
Attn: George Nakagaki, Manager

San Francisco Municipal Railway
Muni Planning Division
949 Presidio Avenue, Room 204
San Francisco, CA 94115
Attn: Peter Straus

San Francisco Committee for
Utility Liaison on Construction
and Other Projects (CULCOP)
c/o GES - Utility Liaison
City Hall, Room 363
San Francisco, CA 94102
Attn: Herman Beneke

San Francisco Department of
Public Works
Traffic Engineering Division
460 McAllister Street
San Francisco, CA 94102
Attn: Scott Shoaf

San Francisco Fire Department
260 Golden Gate Avenue
San Francisco, California 94102
Attn: Joseph Sullivan, Chief
Division of Planning
and Research

San Francisco Public Utilities
Commission
Bureau of Energy Conservation
949 Presidio Avenue, Room 111
San Francisco, CA 94115
Attn: Robin Calhoun, Director

San Francisco Public Utilities
Commission
City Hall, Room 287
San Francisco, CA 94102
Attn: Richard Sklar

San Francisco Office of Public Works
City Hall, Rm. 260
San Francisco, CA 94102
Attn: Jeffrey Lee

San Francisco Real Estate Dept.
450 McAllister Street, Room 600
San Francisco, CA 94102
Attn: Wallace Wortman
Director of Property

Mayor's Economic Development Council
480 McAllister Street
San Francisco, CA 94102
Attn: Mr. Richard Goblirsch

Bureau of Engineering
45 Hyde Street, #222
San Francisco, CA 94102
Attn: Ray Danehy

MEDIA

San Francisco Bay Guardian
2700 - Nineteenth Street
San Francisco, CA 94110
Attn: Patrick Douglas, City Editor

San Francisco Chronicle
925 Mission Street
San Francisco, California 94103
Attn: Marshall Kilduff

MEDIA (cont'd)

San Francisco Examiner
110 - Fifth Street
San Francisco, CA 94103
Attn: Gerald Adams

San Francisco Progress
851 Howard Street
San Francisco, CA 94103
Attn: Mike Mewhinney

The Sun Reporter
1366 Turk Street
San Francisco, CA 94115

LIBRARIES

Documents Department
City Library - Civic Center
San Francisco, CA 94102
Attn: Faith Van Liere

Environmental Protection
Agency Library
215 Fremont Street
San Francisco, CA 94105
Attn: Jean Circiello

Government Documents Section
Stanford University
Stanford, CA 94305

Government Publications Department
San Francisco State University
1630 Holloway Avenue
San Francisco, CA 94132

Hastings College of the Law - Library
198 McAllister Street
San Francisco, CA 94102

Institute of Governmental Studies
1209 Moses Hall
University of California
Berkeley, CA 94720

Golden Gate University
Library
536 Mission St.
San Francisco, CA 94105

Excelsior Branch Library
4400 Mission Street
San Francisco, CA 94112

Glen Park Branch Library
653 Chenery Street
San Francisco, CA 94131

Ingleside Branch Library
387 Ashton Avenue
San Francisco, CA 94112

Mission Branch Library
3359 - 24th Street
San Francisco, CA 94110

Noe Valley Branch Library
451 Jersey Street
San Francisco, CA 94114

Bernal Branch Library
500 Cortland Avenue
San Francisco, CA 94110

GROUPS & INDIVIDUALS

AIA
Northern California Chapter
790 Market Street
San Francisco, CA 94102

Bay Area Council
348 World Trade Center
San Francisco, CA 94111

David Caprone
Lincoln Property Company
220 Sansome Street
San Francisco, CA 94104

Consumer Action
1417 Irving
San Francisco, CA 94122
Attn: Kay Pachtner

Joseph Coriz
2853 - 22nd Street
San Francisco, CA 94110

Downtown Association
582 Market Street
San Francisco, CA 94104
Attn: Lloyd Pflueger

GROUPS & INDIVIDUALS (con'd)

Downtown Senior Social Services
295 Eddy Street
San Francisco, CA 94102

Environmental Science Associates
1291 E. Hillsdale Boulevard
Foster City, CA 94404

Friends of the Earth
1045 Sansome Street
San Francisco, CA 94111
Attn: Connie Parrish

The Foundation for San Francisco's
Architectural Heritage
2007 Franklin Street
San Francisco, CA 94109
Attn: Grant Dehart

Gray Panthers
50 Fell Street
San Francisco, CA 94102
Attn: W. Nunnally

Gruen, Gruen + Associates
564 Howard Street
San Francisco, CA 94105

Heller, Ehrman, White & McAuliffe
44 Montgomery Street, 32nd Floor
San Francisco, CA 94104
Attn: Robert L. Gibney, Jr.

Sue Hestor
4536 - 20th Street
San Francisco, CA 94114

Carl Imparato
1205 Garfield
Albany, CA 94705

Chris Lavdiotis
1919 - 28th Ave.
San Francisco, CA 94116

League of Women Voters
12 Geary Street, Room 605
San Francisco, CA 94108

Legal Assistance to the Elderly
944 Market Street, #803
San Francisco, CA 94102

Gerald Owyang
1517 Reed Ave., #2
San Diego, CA 92109

San Francisco Tomorrow
88 First Street - Room 600
San Francisco, CA 94111
Attn: Suzanne Smith

San Franciscans for Reasonable Growth
88 First Street
San Francisco, CA 94105
Attn: Carl Imparato

John Sanger & Associates
2340 Market Street
San Francisco, CA 94114

Senior Escort Program
South of Market Branch
814 Mission Street
San Francisco, CA 94103

Sierra Club
530 Bush Street
San Francisco, CA 94108
Attn: Becky Evans

Kent E. Soule
Chickering and Gregory
3 Embarcadero Center, 23rd Floor
San Francisco, CA 94111

Tenants & Owners Development Corp.
177 Jessie Street
San Francisco, CA 94105
Attn: John Elberling

Paul Thayer
1033 Stanyan
San Francisco, CA 94117

Timothy Tosta
333 Market Street, Suite 2230
San Francisco, CA 94105

Steven Weicker
899 Pine Street, #1610
San Francisco, CA 94108

Women's Chamber of Commerce
681 Market Street, Room 992
San Francisco, CA 94105

GROUPS & INDIVIDUALS (con'd)

San Francisco Forward
640 Market Street
San Francisco, CA 94104
Attn: Frank Noto

Mrs. G. Bland Platt
339 Walnut Street
San Francisco, CA 94118

Charles Hall Page and Associates
364 Bush Street
San Francisco, CA 94104

San Francisco Beautiful
41 Sutter Street
San Francisco, CA 94104
Attn: Mrs. H. Klussman, President

San Francisco Building & Construction
Trades Council
400 Alabama Street, Room 100
San Francisco, CA 94110
Attn: Stanley Smith

San Francisco Chamber of Commerce
456 California Street
San Francisco, CA 94104
Attn: Richard Morten

San Francisco Ecology Center
13 Columbus Avenue
San Francisco, CA 94111

San Francisco Junior
Chamber of Commerce
251 Kearny Street
San Francisco, CA 94108

San Francisco Labor Council
3068 - 16th Street
San Francisco, CA 94103
Attn: Bernard Speckman

San Francisco Planning and Urban
Research Association
312 Sutter Street
San Francisco, CA 94108

San Francisco Convention and
Visitors Bureau
1390 Market Street, Suite 260
San Francisco, CA 94102
Attn: R. Sullivan, Manager

Jeff Vance
Campeau Corp. of California
681 Market Street
San Francisco, CA 94105

Pillsbury, Madison & Sutro
P. O. Box 7880
San Francisco, CA 94120
Attn: Abby Staeble

Planning Analysis & Development
530 Chestnut Street
San Francisco, CA 94133
Attn: Gloria Root

David P. Rhoades
44 Montgomery Street - Suite 547
San Francisco, CA 94104

Marie Zeller
Whisler-Patri
590 Folsom Street
San Francisco, CA 94105

Environmental Planning & Research, Inc.
649 Front Street
San Francisco, CA 94111
Attn: Leslie de Boer

Charles T. Gill
315 Ivy Street
San Francisco, CA 94102

Calvin Dare
Cushman Wakefield
555 California - Suite 2700
San Francisco, CA 94104

Bendix Environmental Research, Inc.
1390 Market Street - Suite 902
San Francisco, CA 94102

Environmental Simulation Laboratory
316 University Hall
University of California
Berkeley, CA 94720
Attn: Peter Bosselman

Brobeck, Phleger, Harrison
One Market Plaza
San Francisco, CA 94105
Attn: Michael J. Rushman, Esq.

GROUPS & INDIVIDUALS (con'd)

Lincoln Property Company
222 Sansome Street
San Francisco, CA 94104
Attn: David Capron

Chickering & Gregory
3 Embarcadero Center
23rd Floor
San Francisco, CA 94111
Attn: Kent Soule

Business and Professional
Association of Noe Valley
3823-24th Street
San Francisco, CA 94114
Attn: Armando, Bolanos, President

Coalition for San Francisco
Neighborhood
1154 Clement Street
San Francisco, CA 941128
Attn: Jonathan D. Bulkley, President

East and West of Castro Street
Improvement Club
327 Jersey Street
San Francisco, CA 94114

Eureka Valley Merchants
Association
575 Castro Street
San Francisco, CA 94114
Attn: Steven Stegman, President

Eureka Valley Promotion
Association
P. O. Box 14137
San Francisco, CA 94114
Attn: Phil McPhearson, President

Friends of Noe Valley
4095 Army Street
San Francisco, CA 94131
Attn: Mirian Blaustein, President

Glen Park Association
17th Van Buren Street
San Francisco, CA 94131
Attn: Bruce Bonacher

Grand View Neighbors
204 Grand View Avenue
San Francisco, CA 94114
Attn: Elza Strait, Secretary

Noe Valley Merchants Association, Inc.
3952-24th Street
San Francisco, CA 94114

Public Health Center
3840-17th Street
San Francisco, CA 94114
Attn: Ms. Corey, Dist. Health Officer

Twin Peaks Council, Inc.
120 Graystone Terrace
San Francisco, CA 94114
Attn: Albert Meakin, President

Twin Peaks Improvement Association
171 Graystone Terrace
San Francisco, CA 94114
Attn: Gary Faldsey, President

Upper Noe Valley Neighborhood Council
282-29th Street
San Francisco, CA 94131
Attn: A. J. Torrano, President

Victorian Alliance
4143-23rd Street
San Francisco, CA 94114
Attn: Earl Moss, Director

Bernal Heights Association
397 Park Street
San Francisco, CA 94120

Coalition of Outer Mission Organizations
534 Madrid Street
San Francisco, CA 94112

Community Design Center
2101 Bryant Street
San Francisco, CA 94110
Attn: Chuck Turner, Director

Cortland Merchants Association
424 Cortland Avenue
San Francisco, CA 94110
Attn: Ms. Nancy White, President

GROUPS & INDIVIDUALS (con'd)

St. Mary's Park Improvement Club
314 College Avenue
San Francisco, CA 94112
Attn: L. Loughlin, President

Cayuga Improvement Association
2349 Alemany Boulevard
San Francisco, CA 94112
Attn: Mr. Ronald Mota, President

COMO
P. O. Box 12358
San Francisco, CA 94112
Attn: Steve Rabisa, President

Excelsior Business Association, Ltd.
4519 Mission Street
San Francisco, CA 94122

Excelsior District Improvement Assoc.
400 Persia Avenue
San Francisco, CA 94112
Attn: Fred Imsand, President

Geneva-Mission Businessmen's Assoc.
5172 Mission Street
San Francisco, CA 94112
Attn: Ms. Josephine Chevalier, Pres.

New Mission Terrace Improvement Assoc.
830 Darien Qay
San Francisco, CA 94127
Attn: Anthony Sacco, President

Portola District Merchant Assoc.
2497 San Bruno Avenue
San Francisco, CA 94134
Attn: Richard Parodi, Pres., D.D.S.

Portola Heights Voters League
1223 Silver Avenue
San Francisco, CA 94134
Attn: Ramona Spicer, President

Portola & McLaren Park Assoc.
1830 Burrows Street
San Francisco, CA 94134
Attn: Neil Wallace, President

Balboa Terrace Homes Association
651 Upland Drive
San Francisco, CA 94127
Attn: David Slifer, President

Comm. of Park Merced Res.
Comm. to Open Occupancy
101 Tapia Drive
San Francisco, CA 94132
Attn: Mr. Trafficante, Chair

Crestlake Property Owners Association
50 Crestlake Drive
San Francisco, CA 94132
Attn: Daniel Leehane, President

Housing Conservation Institute
315 Granada Avenue
San Francisco, CA 94112

Ingleside Community Association
33 DeMontefort Avenue
San Francisco, CA 94112
Attn: Mr. Miramontes, President

Ingleside Terrace Homes Assoc.
260 Urbano Drive
San Francisco, CA 94127
Attn: Mr. Siden, President

Lakeshore Acres Improvement Club
150 Clearfield Drive
San Francisco, CA 94132
Attn: Mr. Bon, President

Lakeside Village Merchants Association
2621 Ocean Avenue
San Francisco, CA 94132
Attn: David Barron, President

Miraloma Park Improvement Club
238 Bella Vista Avenue
San Francisco, CA 94127
Attn: Ms. Dorothy

Monterey Heights Homes Association
120 Fernwood Drive
San Francisco, CA 94127
Attn: Ms. Raven, President

Mt. Davidson Manor Homeowners Association
830 Darien Way
San Francisco, CA 94127
Attn: Mr. Raabe, President

GROUPS & INDIVIDUALS (con'd)

Ocean Avenue Merchants Association
1417 Ocean Avenue
San Francisco, CA 94112
Attn: Mr. Miles, President

Ocean View, Merced, Ingleside
Community Association
27 Williar Avenue
San Francisco, CA 94112

Park Merced Residents Organization
32 Bucareli
San Francisco, CA 94132
Attn: Leon Cowen, Chair

St. Francis Homes Association
101 Santa Clara Avenue
San Francisco, CA 94127
Attn: Charles Power, Exec. Sec.

South Western Neighborhood Improvement
Group
139 Broad Street
San Francisco, CA 94112
Attn: Rev. Lewis Allen

Stonestown Merchants Assoc., Inc.
20 Stonestown Mall
San Francisco, CA 94132
Attn: Mr. Steve Weiner, President

Sunnyside Neighborhood Association
350 Hearst Avenue
San Francisco, CA 94112
Attn: Ms. Diana Schroder

Westwood Forest Home Association
1 Robinwood Drive
San Francisco, CA 94127
Attn: Tom Hoshiyama, President

Westwood Highlands Association
487 Colon Avenue
San Francisco, CA 94127
Attn: Martin Ward, President

Westwood Park Association
939 Faxon Avenue
San Francisco, CA 94112
Attn: Dr. Bertolotti, President

Mr. Jim Gravanis
74 Mizpah Street
San Francisco, CA 94131

Mrs. L. Grogan
258 Thirtieth Street
San Francisco, CA 94110

Mr. Milton Hanoun
1884 San Jose Avenue
San Francisco, CA 94112

Ms. Rosita Harrison
1933 San Jose Avenue
San Francisco, CA 94112

Ms. Florence Haverty
1947 San Jose Avenue
San Francisco, CA 94112

Ms. Shirley Johnson
1735 B Liberty Street
San Francisco, CA 94110

Mr. John A. Knox, Jr.
3853 Army Street
San Francisco, CA 94131

P. M. La Grave
1735 B Dolores Street
San Francisco, CA 94110

Mr. James MacDougall
1201 Sanchez Street
San Francisco, CA 94114

Ms. Maude Main
266 Thirtieth Street
San Francisco, CA 94131

Mr. Bruce Martin
1878 San Jose Avenue
San Francisco, CA 94112

Mr. Drew McEwen
1792 Dolores Street
San Francisco, CA 94110

Ms. Connie Ortega
106 Delano
San Francisco, CA 94112

Ms. Sylvia Powell
1542-44 Church Street
San Francisco, CA 94131

GROUPS & INDIVIDUALS (con'd)

Mr. Norman Rolfe
2233 Larkin Street
San Francisco, CA 94109

Mr. Andrew Safont
1717 Dolores Street
San Francisco, CA 94110

Mr. and Mrs. Ramon Sanchez
1749 San Jose Avenue
San Francisco, CA 94112

M. Schroeder & E. Schroeder
1708 Dolores Street
San Francisco, CA 94114

Mrs. A. Shandonay
One Otsego Avenue
San Francisco, CA 94112

Mr. Carl A. Smith
1021 Sanchez Street
San Francisco, CA 94114

J. Taylor
24 Thirtieth Street
San Francisco, CA 94131

Mr. Colin M. Thurlow
49 Chenery Street
San Francisco, CA 94131

Mr. Mario Tovani
43 Capistrano Avenue
San Francisco, CA 94112

D. Venturi
200 Thirtieth Street
San Francisco, CA 94131

Ms. Norma Wardell
637 San Jose Avenue
San Francisco, CA 94110

Ms. Evelyn Watts
22 Paulding Street
San Francisco, CA 94112

Mr. Gary Wong
1755 Dolores Street
San Francisco, CA 94110

Ms. Rosa Wood
1832 San Jose Avenue
San Francisco, CA 94112

Mr. John Maraini
141 St. Marys Avenue
San Francisco, CA 94112

Mrs. L. Marcolini
16 Havelock Street
San Francisco, CA 94112

Mr. William McCarthy
1961 San Jose Avenue
San Francisco, CA 94112

Mr. and Mrs. Bernard Murphy
181 Capistrano Avenue
San Francisco, CA 94112

Ms. Angie Olson
82 Havelock Street
San Francisco, CA 94112

Mr. Mario Renzie
2061 San Jose Avenue
San Francisco, CA 94112

Mr. Julio Roca
1905 San Jose Avenue
San Francisco, CA 94112

Mr. and Mrs Gus Rowe
30 Paulding Street
San Francisco, CA 94112

Deborah Sabelli
1975 San Jose Avenue
San Francisco, CA 94112

Mr. John Simpson
252 Theresa Street
San Francisco, CA 94112

Mr. John T. Torpino
1919 San Jose Avenue
San Francisco, CA 94112

GROUPS & INDIVIDUALS (con'd)

Ms. Mary Williams
78 Havelock Street
San Francisco, CA 94112

Mr. Julius Zamacona
63 San Juan Avenue
San Francisco, CA 94112

Yves Barbero
1073 Dolores Street
San Francisco, CA 94110

Mr. Stanley M. Benson
4011-25th Street
San Francisco, CA 94114

Ms. Susan Bragstad
325-27th Street
San Francisco, CA 94131

Mr. Patrick Byrne
1770 Dolores Street
San Francisco, CA 94110

Mr. Robert Callwell
198-29th Street
San Francisco, CA 94110

Mr. A. Canepa
1888 San Jose Avenue
San Francisco, CA 94112

Mr. Henry Cavigli
430 Elizabeth Street
San Francisco, CA 94114

Ms. Mary Cerutti
1882 San Jose Avenue
San Francisco, CA 94112

Ms. Martha Chase
1939 San Jose Avenue
San Francisco, CA 94112

Mr. Jose Costello, Jr.
1790 Dolores Street
San Francisco, CA 94110

F. Cunningham
50 Paulding Street
San Francisco, CA 94112

Mr. David Curtis
1792 Dolores Stret
San Francisco, CA 94110

Mr. Bart Deamer
1335 Douglass Street
San Francisco, CA 94131

Ms. Emilia Emerson
255 Capistrano Avenue
San Francisco, CA 94112

Tryve Ericksen
1745 San Jose Avenue
San Francisco, CA 94112

Mission Planning Council
212 Fair Oaks Street
San Francisco, CA 94110
Attn: Ms. Luisa E. Esquerro, President

San Francisco Bicycle Coalition
701 Ulloa Street
San Francisco, CA 94116
Attn: Mr. Darrell Skrabak

Citizens Action League
814 Mission Street
San Francisco, CA 94103
Attn: Ms. Denise Bergez

Glen Park Assoc. - Traffic Com.
815 Chenery Street
San Francisco, CA 94131
Attn: Ms. Laura Dogerez

Dolores Heights Improvement Club
3991 - 20th Street
San Francisco, CA 94114
Attn: Mrs. Nancy Kahn, Chairperson

J.O.S.E.
266 Cotter Street
San Francisco, CA 94112
Attn: Ms. Marian Aird, President

F. Nielsen
25 Milton Street
San Francisco, CA 94112

GROUPS & INDIVIDUALS (con'd)

Mr. Ken Salazar
1979 San Jose Avenue
San Francisco, CA 94112

Mr. Richard G. Mumford
1792 Dolores Street, #2
San Francisco, CA 94110

Ms. Claire Pilcher
471 Hoffman Avenue
San Francisco, CA 94114

Supervisor Don Horanzy
City Hall, Room 235
San Francisco, CA 94102

Supervisor Harry Britt
City Hall, Room 235
San Francisco, CA 94102

Supervisor Carol Ruth Silver
City Hall, Room 235
San Francisco, CA 94102

C. R. Arnold
59 La Grande Avenue
San Francisco, CA 94112

Mr. George M. Cohn
112 St. Marys Avenue
San Francisco, CA 94112

Guilford S. Frolich
231 Lee Avenue
San Francisco, CA 94112

Mr. & Mrs Ralph Grandy
1937 San Jose Avenue
San Francisco, CA 94112

Ms. Marie Magnoli
86 Havelock Street
San Francisco, CA 94112

Mr. William Simpson
252 Theresa Street
San Francisco, CA 94112

Mr. Vince Lueta
2586 - 33rd Avenue
San Francisco, CA 94116

Mr. Rene Morales
2518 - 35th Avenue
San Francisco, CA 94116

Supervisor Nancy Walker
City Hall, Room 235
San Francisco, CA 94102

Mr. James Koentopp
2987 Mission Street
San Francisco, CA 94110

Mr. Richard Schlaich
693 Douglass Street
San Francisco, CA 94114

Mr. Rino Bei
61 Lapham Street
San Francisco, CA 94112

VII. LIST OF PREPARERS

Author of Environment Impact Statement

Urban Mass Transportation Administration
Washington, DC 20590
(202) 426-2360

Edward R. Fleischman
Director, Office of Program Assistance

John Barber
Acting Chief, Planning and Analysis Division

Sue C. Kaminsky
Planning and Analyis Division

Abbe Marner
Office of Program Assistance

San Francisco Department of City Planning
450 McAllister Street
San Francisco, CA 94102
(415) 558-5261

Alec Bash
Environmental Review Officer

Barbara Sahm
Assistant Environmental Review Officer

Gail Bloom
Reviewer

Author of Preliminary Draft EIS

Environmental Impact Planning Corpration
319 Eleventh Street
San Francisco, CA 94103
(415) 864-2311

Tom Crews, Principal
Project Manager

With: Charles M. Salter, Consultants in Acoustics

E.M. Ross and Associates

Project Sponsor

Utilities Engineering Bureau
San Francisco Public Utilities Commission
693 Vermont Street
San Francisco, CA 94107
(415) 558-4677

Gerald P. Cauthen
Principal Engineer

Robert Stein
Project Manager

Lynn Pio
Transit Environmental Coordinator

Project Engineers

Parsons Brinckerhoff Quade & Douglas, Inc.
1025 Van Ness Avenue
San Francisco, CA 94109
(415) 474-4500

K.K. See-Tho
Principal-in-Charge

George Stanske
Project Manager

Ross Maxwell
Transportation Engineer

VIII. ORGANIZATIONS AND PERSONS CONSULTED

Association of Bay Area Governments
Hotel Claremont
Berkeley, California 94705
(415) 841-9730
Ray Brady, Chief of Information
and Analyst Systems

San Francisco City Planning Department
450 McAllister Street
San Francisco, California 94102
(415) 558-5260
Peter Groat, Senior Planner

San Francisco Fire Department
260 Golden Gate Avenue
San Francisco, California 94102
(415) 861-8000
Joseph Sullivan, Chief, Planning
and Research Division

San Francisco Police Department
850 Bryant, Room 500
San Francisco, California 94103
(415) 553-1113
James Farrell, Sargeant, Crime
Analysis Division

San Francisco Department of Public Works
Traffic Engineering Division
460 McAllister Street
San Francisco, California 94102
(415) 558-3371
Gordon Chester,
Associate Traffic Engineer

Parson, Brinckerhoff, Quade & Douglas
1625 Van Ness
San Francisco, California 94109
(415) 474-4500
Ross Maxwell, Project Engineer

San Francisco Recreation
and Parks Department
McLaren Lodge - Golden Gate Park
Fell and Stanyan
(415) 558-3706
Tim Liliquist, Management Assistant

San Francisco Department of Public Works
Division of Sanitary Engineering
770 Golden Gate Avenue
San Francisco, California 94102
(415) 558-3671
Nathan Lee, Engineering Associate,
San Francisco Clean Water Program

San Francisco Water Department
425 Mason Street
San Francisco, California 94102
(415) 558-4986
James Cooney, Engineer,
City Distribution Division

Sunset Scavenger Corporation
Foot of Tunnel Road and Beatty
Brisbane, California 94134
(415) 467-8411
Dino Queirolos, Vice President

California Archaeological Inventory
Sonoma State University
Rohnert Park, California 94928
(707) 664-2494
Thelma McGregor, Regional Officer

INDEX

Air Quality, vi, viii, 46-47, 109-115, 129-130, 137, 139

Balboa BART Station, 24, 32, 42-43, 45, 96, 99, 102-103, 105-106

Balboa Park, iii, vii, 1, 15, 20, 24, 26-27, 29, 53, 65-66, 77, 80, 148-149

Bicycles, v, 18, 36, 39, 84, 88

City College of San Francisco, v, 15-16, 18, 48, 58, 80, 91, 104-105

Communication Systems, 30, 79-80, 128

Construction Impacts, 127-134, 137-139

Displacement and Relocations, iv, 63

Economic and Fiscal, iv, 18, 31, 66-75, 127-128, 139-141

Energy, vi, viii, 16-17, 53, 121-123, 132, 136-137, 139-140, 142

Fire Services, viii, 29, 75, 128, 137

Geology, vii-viii, 53-59, 124-126, 132, 134, 138

Glen Park BART Station, 32, 42-43, 45, 94, 103, 108

Growth, iv, 15

Historic and Archaeological Site, vii, 146-149

J-Church Line, i, ix, 1, 3, 5-6, 40, 43, 45, 48, 62-63, 66-67, 69, 71, 82, 84, 87, 91, 93-94, 97-99, 102-107, 109, 117-120, 123, 136, 141-142, 148

K-Ingleside Line, i, 1, 3, 6, 43, 45, 81, 92, 94, 96, 99, 103, 105-106

L-Taraval Line, i, 1, 3, 6, 115

Land Use, ii, vii, 20, 62-63, 127, 135, 137

M-Oceanview Line, i, 1, 3, 6, 43, 45, 66, 74, 92, 94-97, 99, 103, 105-106

Mission Street Alignment, ii, v, 5, 8, 16-18, 25-26, 28, 39-40, 58-59, 62, 65, 69, 71-73, 74-75, 79-82, 92-94, 104-106, 109, 111, 125-126, 128, 134

Monterey Boulevard Alignment, ii, v, 5, 8, 16-18, 24-25, 27-28, 36-39, 58, 65, 67, 69, 74-75, 78-81, 87-92, 102-104, 108-109, 111, 124-126, 128, 134

N-Judah Line, 1, 3, 5-6, 40, 69, 71, 95, 102, 104, 106

Noise, vi, viii, 48-52, 115-120, 130-132, 136, 138-140

Parks, vii, 29, 66, 77, 148-149

Pedestrians, 18, 83, 107-109

Plans and Policies, iii, 65-66

Police Services, viii, 29, 77, 128, 137

POM Study, 3, 5-6, 43, 97

Population, 28, 29

Power and Natural Gas, 77

San Francisco State University, 1, 3, 15, 63, 95, 97, 99, 104, 106

San Jose Avenue Alignment, ii, iv, 5, 8, 16-18, 23-24, 26-27, 32, 35-36, 53-54, 58, 62, 66-67, 74, 78-79, 81, 84-87, 98-99, 102, 108, 111, 124, 126-128, 132

Schools, 29-30, 77

Seismicity, vii, viii, 53-59, 124-126, 134, 138

Sewer and Stormwater Drainage, ix, 30, 82, 126-127, 129, 135, 138-139

Soils, vii, 53-59, 124-126, 132, 134, 138

Solid Waste, 30, 129

Stanford Heights Reservoir, ix, 58, 124, 126

Stonestown Shopping Center, 1, 3, 15, 63, 95, 99

Traffic, iv-v, 17-18, 31-40, 82-94, 135-136, 139-140

Transit, 17-18, 40-45, 94-106

Vegetation, vi, 52-53, 120-121

Vibration, vi, viii, 48-52, 115-120, 136, 139-140

Visual Quality, ii, 16, 26, 63-64, 135, 139-140

Water Services, viii, 30, 81-82, 128-129

Zoning, 20, 62

APPENDIX A: FUNDAMENTAL CONCEPTS OF ENVIRONMENTAL NOISE

This section provides background information to aid in understanding the technical aspects of this report.

Three dimensions of environmental noise are important in determining subjective response. These are:

a. the intensity or level of the sound;
b. the frequency spectrum of the sound;
c. the time-varying character of the sound.

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing.

The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound. The unit of measurement is the cycle per second (cps) or Hertz (Hz). Most of the sounds which we hear in the environment do not consist of a single frequency, but of a broad band of frequencies, differing in level. The quantitative expression of the frequency and level content of a sound is its sound spectrum. A sound spectrum for engineering purposes is typically described in terms of octave bands which separate the audible frequency range (for human beings, from about 20 to 20,000 Hz) into ten segments.

Many rating methods have been devised to permit comparisons of sounds having quite different spectra. Fortunately, the simplest method correlates with human response practically as well as the more complex methods. This method consists of evaluating all of the frequencies of a sound in accordance with a weighting that progressively and severely deemphasizes the importance of frequency components below 1000 Hz, with mild deemphasis above 5000 Hz. This type of frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency midrange.

The weighting curve described above is called "A" weighting, and the level so measured is called the "A-weighted sound level", or simply "A-level".

The A-level in decibels is expressed "dBA"; the appended letter "A" is a reminder of the particular kind of weighting used for the measurement. In practice, the A-level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. All U.S. and international standard sound level meters include such a filter. Typical A-levels measured in the environment and in industry are shown in Figure A-1.

Although the A-level may adequately describe environmental noise at any instant in time, the fact is that the community noise level varies continuously. Most environmental noise includes a conglomeration of distant noise sources which

creates a relatively steady background noise in which no particular source is identifiable. These distant sources may include traffic, wind in trees, industrial activities, etc. These noise sources are relatively constant from moment to moment, but vary slowly from hour to hour as natural forces change or as human activity follows its daily cycle. Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These may include nearby activities or single vehicle passages, aircraft flyovers, etc., which cause the environmental noise level to vary from instant to instant.

To describe the time-varying character of environmental noise, the statistical noise descriptors L10, L50, and L90 are commonly used. The L10 is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period. The L10 is considered a good measure of the "average peak" noise. The L50 is the A-weighted sound level that is equaled or exceeded 50 percent of a stated time period. The L50 represents the median sound level. The L90 is the A-weighted sound level equaled or exceeded during 90 percent of a stated time period. The L90 is used to describe the background noise.

As it is often cumbersome to describe the noise environment with these statistical descriptors, a single number descriptor called the Leq is also widely used. The Leq is defined as the equivalent steady-state sound level which in a stated period of time would contain the same acoustic energy as the time-varying sound level during the same time period. The Leq is particularly useful in describing the subjective change in an environment where the source of noise remains the same but there is change in the level of activity. Widening roads and/or increasing traffic are examples of this kind of situation.

In determining the daily measure of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises.

During the nighttime, exterior background noises are generally lower than the daytime levels. However most household noise also decreases at night and exterior noises become very noticeable. Further most people are sleeping at night and are very sensitive to noise intrusion.

To account for human sensitivity to nighttime noise levels a descriptor, Ldn, (day-night equivalent sound level) was developed. The Ldn divides the 24-hour day into the daytime of 7 am to 10 pm and the nighttime of 10 pm to 7 am. The nighttime noise level is weighted 10 dB higher than the daytime noise level. The Ldn, then, is the A-weighted average sound level in decibels during a 24-hour period with 10 dBA added to the hourly Leqs during the nighttime. For highway noise environments the Leq during the peak traffic hour is approximately equal to the Ldn.

The effects of noise on people can be listed in three general categories:

1) subjective effects of annoyance, nuisance, dissatisfaction;
2) interference with activities such as speech, sleep, learning;
3) physiological effects such as startle, hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Unfortunately, there is as yet no completely satisfactory measure of the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance, and habituation to noise over differing individual past experiences with noise.

Thus, an important parameter in determining a person's subjective reaction to a new noise is the existing noise environment to which one has adapted: the so-called "ambient" noise. "Ambient" is defined as "the all-encompassing noise associated with a given environment, being a composite of sounds from many sources, near and far". In general, the more a new noise exceeds the previously existing ambient, the less acceptable the new noise will be judged by the hearers.

With regard to increases in noise level, knowledge of the following relationships will be helpful in understanding the quantitative sections of this report:

a) Except in carefully controlled laboratory experiments, a change of only 1 dBA cannot be perceived.
b) Outside of the laboratory, a 3-dBA change is considered a just-noticeable difference.
c) A change in level of at least 5 dBA is required before any noticeable change in community response would be expected.
d) A 10-dBA change is subjectively heard as approximately a doubling in loudness, and would almost certainly cause an adverse change in community response.

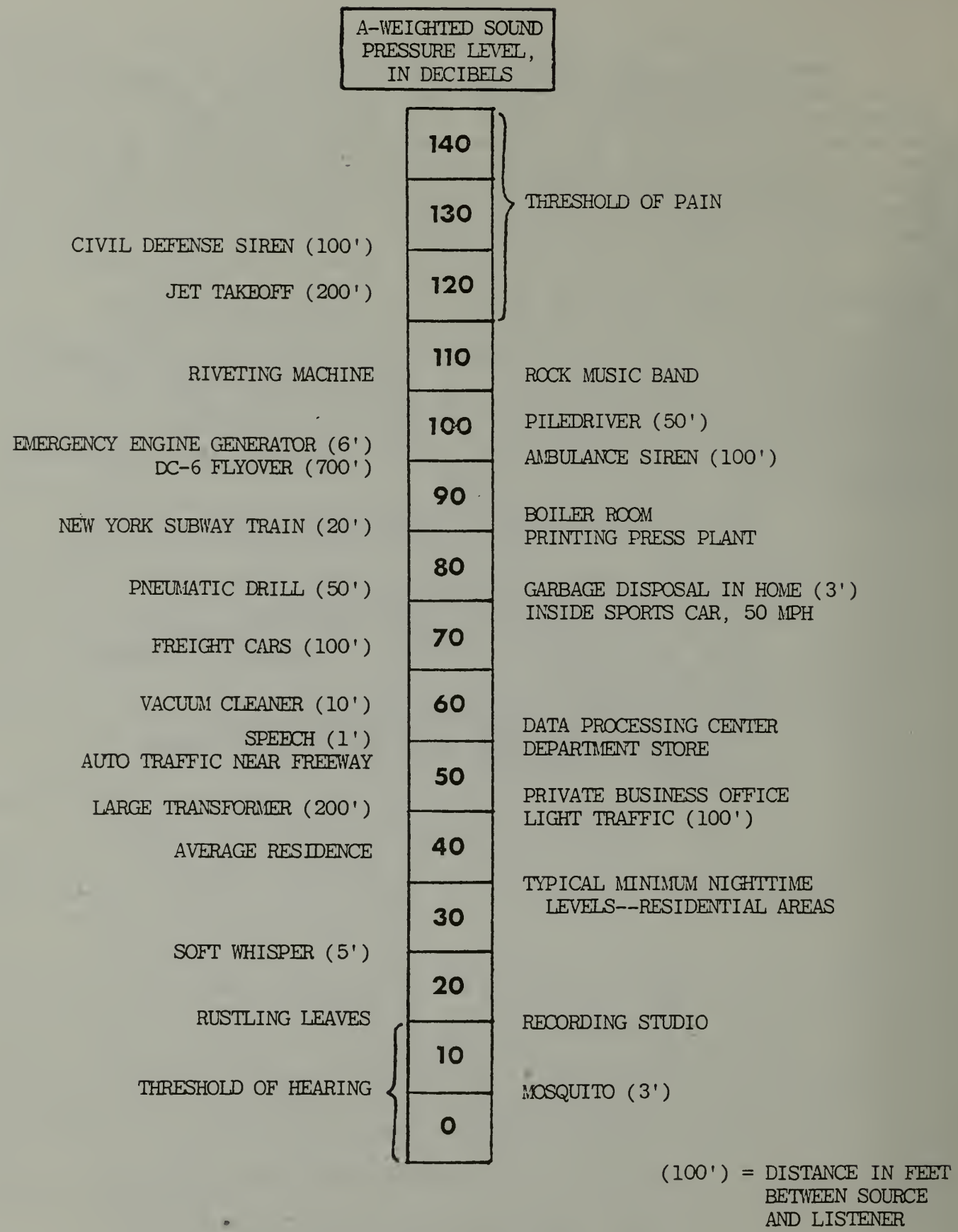


FIGURE A-1: TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT AND INDUSTRY

TABLE 1

HOURLY BREAKDOWN OF OPERATIONS AND EXPECTED HOURLY LEQs
AT A DISTANCE OF 33 FEET FROM ANY J LINE CONNECTION

(Alternative Alignments - Muni Contribution Only)

Hour	Muni Operations[1]	Leq at 33 Feet (dBA)
4 - 5 a.m.	4	49
5 - 6 a.m.	14	55
6 - 7 a.m.	22	57
7 - 8 a.m.	19	56
8 - 9 a.m.	22	57
9 - 10 a.m.	23	57
10 - 11 a.m.	20	56
11 a.m. - noon	20	56
noon - 1 p.m.	20	56
1 - 2 p.m.	20	56
2 - 3 p.m.	20	56
3 - 4 p.m.	26	58
4 - 5 p.m.	20	56
5 - 6 p.m.	19	56
6 - 7 p.m.	25	57
7 - 8 p.m.	23	57
8 - 9 p.m.	17	56
9 - 10 p.m.	10	53
10 - 11 p.m.	10	53
11 p.m. - midnight	8	52
midnight - 1 a.m.	7	52
1 - 2 a.m.	8	52
		Ldn = 60 dBA

[1] Includes N line LRVs.

TABLE 2

EXPECTED INCREASE IN TYPICAL MAXIMUM NOISE LEVELS,
HOURLY LEQ BETWEEN 5:00 A.M. AND 6:00 A.M. AND LDN AT EACH
MEASURMENT SITE ALONG THE ALTERNATIVE J LINE CONNECTION ALIGNMENTS

Site No.	Existing Leq from 5-6 a.m.	Increase in Leq from 5-6 a.m. (dBA)	Increase in Maximum Noise Level (dBA)
1	50	4	0
2	60	1	0
3	58	1	0
4	56	2	0
5	56	2	0
6	56	1	0
7	58	0	0
8	58	0	0
9	53	3	0
10	62	1	0

APPENDIX B

AIR QUALITY

The air quality levels recommended by the Bay Area Air Quality Management District[1] were used to predict curbside CO concentrations at the most heavily travelled and impacted intersections in the project area. This model is a baussian line source model which was applied to the following conditions:

	1-Hour Average	8-Hour Average
Stability Class	E	D
Wind Speed (meters per second)	1	2
Wind Angle (to the road)	22.5°	22.5°
Traffic Speed (miles per hour)	10	20
Background Concentrations[2] (parts per million)	12	6

An air quality monitoring program designed to measure CO concentrations along the proposed alignments could take several years time to be sure of collecting data during "worst-case" conditions of traffic and meteorology. Further, the existing San Francisco CO monitoring site has been found to adequately represent worst-case CO concentrations when compared to measurements taken under adverse conditions at a downtown site.[3] As a result, no measurements of air quality at the site were taken.

---

[1]Bay Area Air Pollution Control District, Guidelines for Air Quality Impact Analysis of Projects, San Francisco, California, June 1975, updated July 15, 1981.

[2]Background values were supplied by Thomas Perardi, Research and Planning Manager, Bay Area Air Quality Management District, telephone conversation, December 4, 1981. Mr. Perardi identified these values as representing his best professional judgment of background values in an area where CO data has not been collected; they are intended to be conservative estimates of actual CO background.

[3]Association of Bay Area Governments, Air Quality Tech Memo #33, Summary of 1979/1980 CO Hotspot Monitoring Program, Berkeley, California, June 1980.

APPENDIX C

TABLE 1

EXISTING TRAFFIC CONDITIONS

J-Line Connection Corridor

SEGMENT STREET	FROM	TO	ROW WIDTH (feet)	TRAVEL WAY WIDTH (feet)	TRAVEL LANES Outbound + Inbound	PARKING	PROPERTY ACCESS	POSTED SPEED LIMIT	ESTIMATED AVERAGE DAILY TRAFFIC	ESTIMATED P.M. PEAK TRAFFIC(2) Outbound(3)	Inbound(3)
30th St.	Church St.	Dolores St.	60	42 to 44	1 + 1	Yes	Yes	25	(1)	(1)	(1)
30th St.	Dolores St.	San Jose Ave.	60	44	1 + 1	Yes	Yes	25	2,000	100	100
San Jose Ave.	30th St.	Dolores St.	100	39 + 39	3 + median + 3	Yes	Yes	25	29,000 (2)	2,100	800
Dolores St.	30th St.	San Jose Ave.	110	27 + 27	2 + median + 2	Yes	Yes	25	10,000 (2)	500	350
San Jose Ave.	Dolores St.	200 feet south of Randall St.	110	93	4 + median + 4	No	Yes	30	38,000 (2)	2,600 (2)	1,100 (2)
San Jose Ave.	200 feet south of Randall St.	I-280 on-off Ramps	118	37 + 42	Bicycle + 3 + median + 3	No	No	45	38,000 (2)	2,600 (2)	1,000 (2)
San Jose Ave.	I-280 on-off Ramps	I-280 undercrossing	75	30 + 30	1 + median + 1	No	No	45	10,000 (2)	500 (2)	300 (2)
San Jose Ave.	within I-280 undercrossing		68	26 + 26	1 + median + 1	No	No	25(4)	10,000	500	300
San Jose Ave.	I-280 undercrossing	Theresa St.	80	25 + 25	1 + median + 1	No	No	25	10,000	500	300
San Jose Ave.	Theresa Street	Ocean Ave.	68 to 80	58 to 60	2 + 2	Yes	Yes	25	8,000	400	300
Circular Ave.	Diamond St.	Monterey Blvd	Varies	50 to 70	2 + 2	N Side Only	N Side Only	25	6,200 (7)	200	(1)
Monterey Blvd.	Circular Ave.	Gennesse St.	100	70 typical	2 + median + 2	Yes	Yes	25	15,900 (7)	1,000	450

(1) Not Available
(2) 1974 - 1976 Counts, City of San Francisco Traffic Engineering
(3) Outbound - away from downtown.
Inbound - toward downtown.
(4) Speed limit not posted - but geometry constrains speed
(5) Estimated
(6) 1 + 1 lanes east of I-280 on-ramp
(7) 1979 count
(8) No parking east-side 7AM - 6PM

Prepared by Parsons Brinckerhoff, 1981

TABLE 1 (Continued)

EXISTING TRAFFIC CONDITIONS

J-Line Connection Corridor

SEGMENT			ROW WIDTH	TRAVEL WAY WIDTH	TRAVEL LANES	PARKING	PROPERTY ACCESS	POSTED SPEED LIMIT	ESTIMATED AVERAGE DAILY TRAFFIC	ESTIMATED P.M. PEAK TRAFFIC(2)	
STREET	FROM	TO	(feet)	(feet)	Outbound + Inbound					Outbound(3)	Inbound(3)
Gennessee St.	Monterey Blvd.	Staples Ave.	60	36	1 + 1	Yes	Yes	25	4,000 (5)	(1)	(1)
Gennessee St.	Staples Ave.	Judson Ave.	60	30	1 + 1	Yes	Yes	25	4,000 (5)	(1)	(1)
Foerster St.	Monterey Blvd.	Judson Ave.	60	30	1 + 1	(8)	Yes	25	4,000 (5)	(1)	(1)
Staples Ave.	Foerster St.	Gennesse St.	70	30	1 + 1			25	1,000 (5)	(1)	(1)
Staples Ave.	Gennesse St.	Phelan Ave.	70	40				25	1,000 (5)	(1)	(1)
Judson Ave.	Foerster St.	Phelan Ave.	80	60	1 + 1	Yes	Yes	25	8,000 (5)	(1)	(1)
Phelan Ave.	Staples Ave.	Judson Ave.	49 - 53	40 - 44	1 + 1	No	Yes	25	4,000 (5)	(1)	(1)
Phelan Ave.	Judson Ave.	Ocean Ave.	78	58	1 + 1	No	Yes	25	13,200 (5)	(1)	(1)
Ocean Ave.	Phelan Ave.	Metro Center entrance (at I-280 on-ramp)	94 - 112	78 - 94	2 + 2 (6)	No	Yes	25	10,000 (5)	(1)	(1)
30th St.	San Jose Ave.	Mission St.	60	44	1 + 1	Yes	Yes	25	2,000 (5)	(1)	(1)
Mission St.	30th St.	Randall St.	82½	58½	2 + 2	Yes	Yes	25	18,000 (5)	(1)	(1)
Mission St.	Randall St.	Bosworth St.	82½	58½	2 + 2	Yes	Yes	25	17,300 (5)	800	650
Mission St.	Bosworth St.	Silver Ave.	82½	58½	2 + 2	Yes	Yes	25	22,300 (5)	1,100	700
Mission St.	Silver Ave.	Ocean Ave.	82½	58½	2 + 2	Yes	Yes	25	17,000 (5)	(1)	(1)
Ocean Ave.	Mission St.	San Jose Ave.	66	46	1 + 1	Yes	Yes	25	11,800 (3)	600	400

(1) Not Available
(2) 1974 - 1976 Counts, City of San Francisco Traffic Engineering
(3) Outbound - away from downtown.
Inbound - toward downtown.
(4) Speed limit not posted - but geometry constrains speed
(5) Estimated
(6) 1 + 1 lanes east of I-280 on-ramp
(7) 1979 count
(8) No parking east-side 7AM - 6PM

Prepared by Parsons Brinckerhoff, 1981

TABLE 2

LEVELS OF SERVICE DEFINITIONS
FOR SIGNALIZED INTERSECTIONS*

Level of Service A

Level of Service A describes a condition where the approach is an intersection appears quite open and turning movements are made easily. Little or no delay is experienced. No vehicles wait longer than one red traffic signal indication. The traffic operation can generally be described as excellent.

Level of Service B

Level of Service B describes a condition where the approach to an intersection is occasionally fully utilized and some delays may be encountered. Many drivers begin to feel somewhat restricted within groups of vehicles. The traffic operation can generally be described as very good.

Level of Service C

Level of Service C describes a condition where the approach to an intersection is often fully utilized and back-ups may occur behind turning vehicles. Most drivers feel somewhat restricted, but not objectionably so. The driver occasionally may have to wait more than one red traffic signal indication. The traffic operation can generally be described as good.

Level of Service D

Level of Service D describes a condition of increasing restriction causing substantial delays and queues of vehicles on approaches to the intersection during short times within the peak period. However, there are enough signal cycles with lower demand such that queues are periodically cleared, thus preventing excessive back-ups. The traffic operation can generally be described as fair.

Level of Service E

Capacity occurs at Level of Service E. It represents the most vehicles that any particular intersection can accommodate. At capacity there may be long queues of vehicles waiting upstream of the intersection and vehicles may be delayed up to several signal cycles. The traffic operation can generally be described as poor.

Level of Service F

Level of Service F represents a jammed condition. Back-ups from locations downstream or on the cross street may restrict or prevent movement of vehicles out of the approach under consideration. Hence, volumes of vehicles passing through the intersection vary from signal cycle to signal cycle. Because of the jammed condition, this volume would be less than capacity.

*City and County of San Francisco, Department of Public Works, Traffic Engineering Division.

TABLE 3

TRAFFIC LEVELS OF SERVICE

FOR FREEWAY CONDITIONS

Level of service A describes a condition of free flow, with low volumes and high speeds. Traffic density is low, with speeds controlled by driver desires, speed limits, and physical roadway conditions. There is little or no restriction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.

Level of service B is in the zone of stable flow, with operating speed beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed and lane of operation. Reductions in speed are not unreasonable, with a low probability of traffic flow being restricted. The lower limit (lowest speed, highest volume) of this level of service has been associated with service volumes used in the design of rural highways.

Level of service C is still in the zone of stable flow, but speeds and maneuverability are more closely controlled by the higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained, with service volumes perhaps suitable for urban design practice.

Level of service D approaches unstable flow, with tolerable operating speeds being maintained though considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and comfort and convenience are low, but conditions can be tolerated for short periods of time.

Level of service E cannot be described by speed alone, but represents operations at even lower operating speeds than in level D, with volumes at or near the capacity of the highway. At capacity, speeds are typically, but not always, in the neighborhood of 30 mph. Flow is unstable, and there may be stoppages of momentary duration.

Level of service F describes forced flow operation at low speeds, where volumes are below capacity. These conditions usually result from queues of vehicles backing up from a restriction downstream. The section under study will be serving as a storage area during parts or all of the peak hour. Speeds are reduced substantially and stoppages may occur for short of long periods of time because of the downstream congestion. In the extreme, both speed and volume can drop to zero.

Source: Highway Capacity Manual (1965), p. 81.

TABLE 4

ESTIMATED ROUTE SEGMENT DAILY PATRONAGE
1975 ON-BOARD SURVEY

Route	Segment Boundaries	Boardings Inbound	Outbound	Total
SAN JOSE AVENUE/CHENERY STREET CORRIDOR				
26 Volencia	San Jose & Sagamon to Bosworth & Diomond	800	680	1,480
26X Volencia Express	San Jose & Sagamon to San Jose @ Monterey	130	0	130
SUBTOTAL		**930**	**680**	**1,610**
(10 Monterey)	(Bosworth & Diomond to 30th & Mission)	(770)	(1,760)	(2,530)
26 Valencia	Basworth & Diamond to 30th & Mission	560	780	1,340
26X Valencia Express	San Jose & Monterey to 24th & Guerrero	20	0	20
SUBTOTAL WITHOUT 10		**580**	**780**	**1,360**
(SUBTOTAL WITH 10)		(1,350)	(2,540)	(3,890)
TOTAL WITHOUT 10		**1,510**	**1,460**	**2,970**
(TOTAL WITH 10)		(2,280)	(3,220)	(5,500)
BART (1975 Estimate)	Glen Park Station			2,900
	Balboa Pork Stotion			2,800
				5,700
MONTEREY/PHELAN CORRIDOR				
36 Miraloma	Phelan & Ocean to Forrester & Monterey	490	300	790
10 Monterey	Manterey & Genessee to Bosworth & Diamand	860	530	1,340
TOTAL		**1,350**	**830**	2,180
MISSION/OCEAN CORRIDOR				
12 Ocean	Ocean & Phelon to Ocean & Misslon	1,990	360	2,350
SUBTOTAL		**1,990**	**360**	**2,350**
12 Ocean	Misslan & Ocean to Mission & Crescent	2,140	1,310	3,450
14 Mission	Mlssian & Ocean to Misslan & Crescent	1,410	690	2,100
14L Mission Limited	Mission & Ocean to Mission & Crescent	410	360	770
14GL Guerrero Limited	Mission & Ocean to Mission & Crescent	100	10	110
14X Mission Express	Missian & Ocean to I-280 Freeway	380	0	380
SUBTOTAL		**4,440**	**2,370**	**6,810**
9 Richland	Mission & Crescent ta Missian & 25th Street	(620)	(230)	(850)
12 Ocean	Mission & Crescent to Missian & 25th Street	(2,160)	(1,210)	(3,370)
14 Mission	Mission & Crescent ta Mission & 25th Street	(1,730)	(1,400)	(3,130)
14L Mission Limited	Mission & Crescent ta Misslan & 25th Street	(220)	(260)	(480)
14GL Guererro Limited	Mission & Crescent to Guerrera & 25th Street	(160)	(10)	(170)
SUBTOTAL		**(4,890)**	**(3,110)**	**(8,000)**
(Assume 30% of ridership in segment between Crescent and 30th, and 70% ridership between 30th and 25th)		1,470	930	2,400
TOTAL		**7,900**	**3,660**	**11,560**